Southwestern AVIATION

NOVEMBER, 1934

SMITHSONIAN INSTITUTION,
FEB 28 1935
LANGLEY AERONAUTICAL LIBRARY

The Gyroscope
As Applied to Flight Instruments

+ +

Hammond Model Y
for the D.O.C. Inspectors

+ +

Manhattan's First Muny Airport
Epitome of Accessibility

+ +

On The Record
Air Transport Testimony

+ +

Two Orions

+ +

Aircraft 1934
Bellanca "Irish Swoop"
Boeing 247-D

20¢

SUPPLY & DEMAND

THERE is but one explanation for the meteoric acceptance of *Southwestern* AVIATION throughout the South and Southwest. It is the desire of airmen and aviation enthusiasts to have a publication of their own.

Along the route in the past few years, impotent publications have sprung up in the South and Southwest, bidding for favor from the men in the industry. Existing for a few months or possibly a year, they have passed into oblivion or complete annihilation to the abject disgust and disappointment of exploited aeronauts.

The year 1934 has given them *their own* long-sought publication. Dedicated to the development of aviation in the most natural flying regions in the United States, sworn to the dissemination of constructive and reliable information, recording the progress of the industry both nationally and regionally, *Southwestern* AVIATION fulfills their most exacting demands.

From Atlanta to Tucson, from Saint Louis to the Gulf of Mexico, *Southwestern* AVIATION's concentrated distribution is unparalleled because it fills a definite need in a definite territory—never before accomplished by any aeronautical publication. Its adequate and constantly growing circulation in the most potential markets for aircraft in the United States makes for its high advertising value to the industry it serves.

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High above the hurricane lashed waters of the Caribbean—

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And in every part of the United States, the graduates of Parks Air College are carrying on the Conquest of the Air started by the resourceful Orville and Wilbur Wright just 31 years ago.

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Editorials and Comments

Army's System

AFTER eleven months of exhaustive study and experimentation by the Bureau of Air Commerce in which various systems and modifications for blind landing were investigated and tested, the announcement comes that the Air Corps' radio blind landing system has been adopted as standard by the Bureau.

Impressively a matter of simple routine, the system bids fair towards the solution of arrival and departure of aircraft in fog and mist, in sleet and snow, when the landing area is obliterated by the quirks of Old Man Weather. More than 150 successful unassisted, hooded landings with a tri-motor transport plane were made by Bureau pilots during the tests.

The project has been made possible by the wholehearted, public-spirited and unselfish co-operation of the Air Corps with the Bureau during the many months of research. Especially at this time it is significant that the Air Corps has worked in harmony and with unlimited generosity, giving civil aeronautics the benefit of their developments. As in the words of Chester A. Snow, Jr., who directed the blind landing tests for the Bureau, "The splendid type of interdepartmental co-operation thus initiated augurs well for future air accomplishment."

The Race

IT WILL be a long time before aviation receives the front page publicity afforded during the MacRobertson Race from Mildenhall Aerodrome to Melbourne, Australia. It will perhaps be a long time before another race so colorful as the October Classic will be run, but whether it be one year or ten, something ought to be accomplished in formulating and applying race requirements by race committees towards minimizing inconsistencies, biased technical interpretations, and red tape as long as the route to be flown. The greatest air race in history placed its greatness in jeopardy by a mass of confusing, conflicting and altogether inconsistent rulings.

We remember that in March, this year, the Air Race Subcommittee designated for the race "aircraft capable of making sustained long flights . . . and carrying very considerable pay loads—aircraft of the type that would be most suitable for the solution of Australia's geographical problem."

It was presumed by aeronauts in all nations that the sponsors desired the great race to prove an impetus to air transportation and an encouragement to the advancement of aeronautics throughout the world. Forcing some especially designed racing equipment out of the race by narrow interpretations of the rulings yet permitting others of the same category to make the flight, the Committee's action smacks of blatant favoritism.

However that may be, the final outcome of the race was sufficient evidence of American supremacy in the production of commercial transport equipment—aircraft that not only solves the problems of geography, but aircraft that is capable of making sustained long flights and carrying real, honest-to-goodness pay loads. When the American transports, the Douglas Airliner, piloted by the famous Dutch team of Moll and Parmentier, carrying a pay load of passengers and cargo, and the Boeing 247-D, piloted by our own Turner and Pangborn, crossed the finish line close on the heels of the De Haviland racer, England, Australia and the world realized the type equipment necessary to transport passengers, mail and express, vicissitudes of long distances, the elements and the terrain notwithstanding.

That American manufacturers and American pilots have been sorely disappointed and somewhat disillusioned in the way the race was carried on, can easily be understood. The Comet De Haviland, "Grosevenor House," is a great plane. Her performance and the work of Black and Scott at the controls deserve the acclaim that they universally received. But what would Col. Fitzmaurice's long-range, load-carrying, Bellanca "Irish Swoop" have done had it not been forced out of the race by the last-minute limitation of its gasoline load to such an extent that one thousand miles was lopped from the plane's potential range? That question somewhat lessens the glory surrounding the De Haviland "Grosevenor House" of the staunch Englishmen.

Every tremendous undertaking has problems in proportion to its magnitude; the Big Race had its share. There is a glow of encouragement in believing that perhaps in the future the great air races to come will be governed and directed in the light of experiences of their predecessors, accomplishing in the end the noble purposes for which they are initiated by far-sighted and generous personalities of the MacPherson Robertson type.

Enrollments

THE substantial increase of enrollments in our American air colleges and technical institutes throughout the autumn months is indeed a bright index as the year 1934 draws to a close, especially to all who are interested in tomorrow's technicians and executives. The steady gain in the number of American youth choosing aeronautics as their life's profession is one of aviation's most valuable assets.

The industry is absorbing the finished products in proportion to the increased enrollments, but more significant to the embryo graduates is the fact that aviation is constantly opening up new channels of development that require superbly trained men for technical and executive leadership.

Fiasco

IT IS to be regretted by all aeronauts that we now have within our borders the destructive forces of price cutting at work in the air transport phase. Certain operators have slashed fares to disgustingly low figures and by so doing have not only made the business unprofitable for themselves, but have disturbed the

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Devoted to the advancement of aeronautics in the South and Southwest and the development of those regions as the most potential markets for aircraft in the United States.

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THE COVER:

A striking flight photo of Pan American's Sikorsky S-42, whose designer, Igor Sikorsky, announced in October plans for an even greater flying boat for transoceanic service. With the flying range of 4,600 miles at a cruising speed in the vicinity of 200 miles per hour, the proposed mammoth plane will weigh some 116,000 pounds and will carry 55 passengers in addition to cargos of mail and express. The S-42, now in regular service between North and South America, is itself capable of spanning the Atlantic or Pacific with its capacity of 32 passengers, mail and express. The proposed flying boat will be equipped with dining and sleeping accommodations.

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The Gyroscope as Applied to Flight Instruments

By W. H. Smiley *

THE increasing number of completed schedules being recorded by all air transport companies is due in no small measure to the development of instruments for use in blind flight or when there is no outside visual reference, and in the development of a number of these instruments the gyroscope has been used very successfully.

The word gyroscope is derived from two Greek words—*guros*, meaning tour or revolution, and *skopien*, meaning to view. Thus the literal translation of the combined words is, to view the revolution, and was invented by the French as a name for an instrument to illustrate the rotation of the earth. However, the scientific meaning of the gyroscope is taken to mean a rotating wheel so suspended as to be free to move about any axis, thus having three degrees of freedom.

Gyroscopical phenomena are exhibited in all rotating bodies but are more apparent in those having large "angular momentum." This momentum depends directly on the weight, speed of rotation and the square of the radius at which the mass is located from the center of the gyro-wheel or rotor. Therefore, for gyroscopical action to be pronounced, the rotor should be heavy and for a given weight the material should be placed as far as practical from the center or concentrated on the rim and so distributed as to be as near perfectly balanced as possible. All gyroscopical wheels, whether for demonstration purposes or practical use, are so constructed and are mounted in various ways, this depending upon the nature of their use and the duties they are to perform.

Rigidity and Precession

The two properties of the gyroscope, which were utilized in the development of flight instruments, are—Rigidity (in plane of rotation or relative to space) and Precession. Precession is that property which causes a gyro-wheel rotating about one axis to attempt to line up with the axis about which an outside force is applied. Therefore, if an outside force is applied to a rotating gyro the resultant movement will be as if the force had been applied at a point ninety degrees in the direction of rotation or at right angles to the applied force. Rigidity is that property of a gyroscope which tends to hold the gyro-wheel or rotor in a fixed position relative to space provided it is mounted with three degrees of freedom and no outside force of any nature is applied. The three degrees of freedom means that the rotor must be free to move about three axes:—namely, the spinning axis, the vertical axis and the horizontal axis. The spinning and vertical axes are always at right angles to each other and as are also the horizontal and vertical axes but the spinning axis may be at any angle with the horizontal axis. If a gyroscope, having complete freedom, is so made that it can be spun continuously and is frictionless in its supports, it will demonstrate its rigidity relative to space in a remarkable manner. For example, if such a gyroscope were placed on the equator with its axle horizontal to the surface of the earth and pointing in an east and west direction, it will show apparent rotation. At the end of three hours the west end of the axle will be depressed forty-five degrees. At the end of six hours the axle will be in a vertical position, relative to the surface of the earth, having turned through a quarter revolution in a quarter day. At the end of twelve hours the axle will again be in a horizontal position but with the ends reversed. This apparent rotation continues and at the end of twenty-four hours (actually twenty-three hours, fifty-six minutes and four seconds) the original position of the axle is regained, apparently having completed one revolution in one day. Actually the spinning axis of the rotor has remained parallel to its original position while the whole gyroscope assembly has been carried along with the earth by the revolution of the earth about its polar axis.

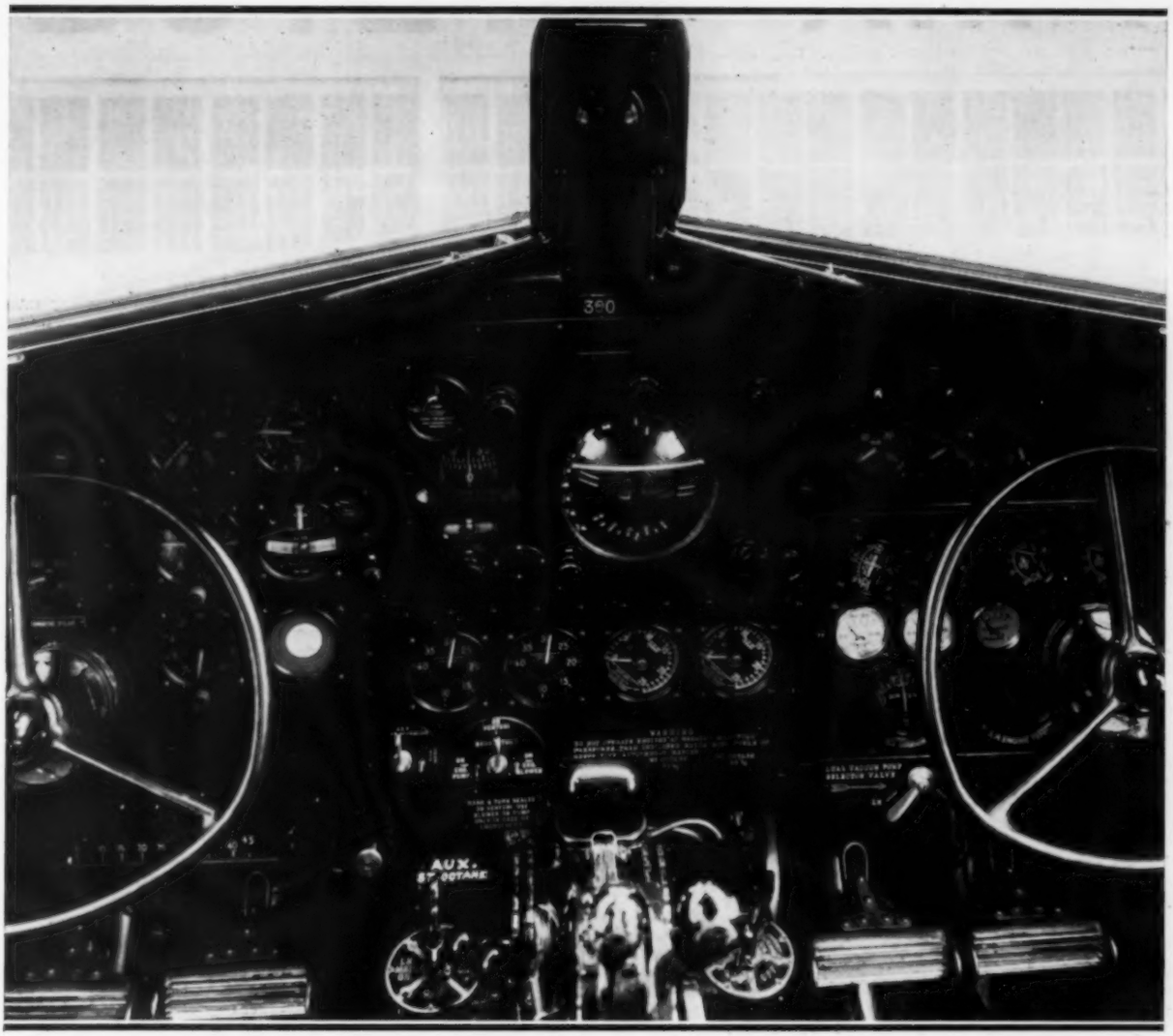
This and all similar gyroscopial phenomena bear out Newton's First Law of Motion which states—"a body continues or perseveres in a state of rest, or of uniform motion in a straight line except insofar as it may be deflected therefrom by an externally applied force." This law, when applied to a rotating wheel or gyroscope may be expressed by stating that the rotor tends to maintain the direction of its plane of rotation and axis in space.

Turn Indicator

THE first flight instrument in which a gyroscope was utilized was the Turn Indicator. This instrument indicates when the airplane is making a turn by the deviation of the hand from its center position to the side in which direction the turn is being made. It does not show the amount of turn being made but rather the relative rate of speed at which the airplane is turning, the faster the turn is being made, the farther the hand deviates from its center position. When the airplane is in straight flight there is no deviation, the hand remaining at its center position. The property of precession of the gyroscope is used as the directive force in this instrument.

The principal parts of the Turn Indicator are, the case inside of which is mounted a small gyro-wheel so that it rotates about a lateral axis (that is, the axle is in a horizontal position but at right angles to the direction of flight). The rotor is mounted in a frame which is pivoted in the case in such a manner that it is free to rotate about a fore and aft axis. The rotation of the rotor frame is, however, surpressed by a spring attached to the upper side of a disc secured to one end of the frame. On the lower side of the disc is a pin which rides between the prongs of a fork attached to the lower end of the pointer or indicating hand. This hand is the only movable part of the mechanism visible to the pilot and it moves in an

*Pilot, T. W. A., Inc.



The instrument panel of the Douglas Luxury Airliner, detailing the important instruments applying gyroscopic principles. In the upper center section of the panel may be seen the instruments of the Sperry Automatic Pilot which include the Flight Attitude Indicator, the Directional Gyro or Course Indicator, the adjustments for lateral and longitudinal stability and the rudder, or course-changing adjustment. The control switch for the automatic pilot may be seen in the lower left center of the photo. The conventional turn and bank indicator is visible between the Directional Gyro and the wheel on the left.

opposite direction to the rotation of the disc. There is also a dash pot or damper, in the shape of a small piston and cylinder, attached to the top of the disc and is used to prevent an oscillating or fluctuating movement of the hand. The rotor has small air buckets on the outer rim into which is directed a stream of air which enters the case through an air jet located on top and to the rear of the case, causing the rotor to be spun at a speed of about 10,000 r. p. m. and in such a direction that the top of the rotor will move in the same direction as the ship in normal flight. That is to say, if it were possible to view the movement of the rotor while standing to the right side of the airplane, it would be noted that it was turning in a clockwise direction. The air is drawn out of the case by means of a venturi tube or other sources of vacuum and the replacing air enters through the air jet which is the only other opening in the case.

Right and Left Turns

Now, for example, when the airplane turns to the right it moves about a vertical axis causing the instrument to be moved about the same axis. This causes a force to be applied against the rotor and due to precession it attempts to place itself in such a position that it will also rotate about a vertical axis. As a result, due to the direction of rotation of the rotor, the rotor frame now moves in a counter-clockwise direction (looking at it from the cockpit) on its fore and aft axis. This causes the disc attached to the end of the frame to rotate in the same direction and as the linkage between the disc and the pointer is so constructed that they move in opposite directions, the hand moves in a clockwise direction or to the right, thus indicating a right turn is being made. The faster the turn is being made the more force is applied against the rotor and greater is the tendency of the rotor to precess, stretching the spring at the top of the disc to a greater degree and consequently bringing about a greater movement of the hand from the center position. As soon as the airplane ceases to turn there is no force applied against the rotor, it has no tendency

to precess and the spring pulls the assembly back to center regardless of the amount of change in the direction of flight. The amount of damping, as well as the tension of the spring, is adjusted to provide the correct amount of sensitivity for any required performance—such as thirty seconds being required to complete a ninety-degree turn with the hand one width off center—and this performance will not vary regardless of the speed of the airplane in which the instrument might be placed, the only difference being that, the greater the speed of the airplane, the greater arc will be flown for any given degree of turn.

If the airplane is turned to the left the force applied against the rotor is in the opposite direction to that when a right turn is being made and of course the rotor has a tendency to precess in the opposite or clockwise direction and the resultant action causes the hand to move to the left indicating a left turn.

Directional Gyro

THE next instrument to be developed around the gyroscope was an azimuth indicator known as a Directional Gyro. Inasmuch as the magnetic compass cannot be held on the magnetic meridian without lag or oscillation precise turns and straight flight cannot be accomplished under conditions of blind flight, especially if turbulent air is encountered.

The successfully developed gyro compass, used almost universally in marine navigation, could be built for use in aircraft, but its weight, space required for installation and the item of expense make it prohibitive for the average airplane and in its stead, for flight use, the directional gyro has been developed. This instrument is not affected by the presence of magnetic or electrical disturbances in or near the airplane or by the maneuvers of ordinary flight. However, unlike the gyro compass, it has no meridian seeking properties and has to be used in conjunction with the magnetic compass. That is, the reading of the directional gyro has to be synchronized with the reading of the magnetic compass and occasionally checked and reset.

In building the Directional Gyro the property of rigidity of the gyroscope was utilized. The principal parts of the instrument are—the rotor, a gimbal ring and a vertical ring. The rotor is mounted, with its axle parallel to the surface of the earth, in the gimbal ring. The gimbal ring is in turn mounted, on a horizontal axis, in the vertical ring and the vertical ring is then mounted in the case on a vertical axis and carries the compass card near the top. In order to reduce the friction as much as possible cone pivots and ball bearings are used in all the mountings except at the bottom of the vertical ring where a ball thrust and radial guide bearing is utilized. With the rotor, gimbal ring and vertical ring being mounted in this manner, the rotor has three degrees of freedom, and the airplane may turn about the assembly in azimuth or on a vertical axis without disturbing the rotor and allowing it to maintain its rigidity relative to space and at the same time also allow sufficient freedom in other directions so that it will not be disturbed by normal bank and pitch motions of the airplane.

Operation

Air is drawn out of the case by means of a venturi tube or other sources of vacuum and the replacing air spins the rotor at a speed of about 12,000 r. p. m., this air being directed into the buckets on the outer rim of the rotor through an air duct having two jets. The air enters the case through the bottom, continues up through the lower bearing of the vertical ring and then into the duct which is attached to the vertical ring. Also attached to the inside of the vertical ring is a lever used to hold the gimbal ring, and thus also the axle of the rotor, parallel to the horizontal plane of the airplane while the reading of the instrument is being synchronized with that of the magnetic compass. When not in use this lever rests upon the lower end of the vertical ring installed about the lower vertical ring bearing housing. Another lever, attached to the case, has one end in a groove in this ring and the other end extended to the inside of the synchronizing knob which extends through the face of the case near the bottom. When this knob is pushed in it actuates the lever secured to the case in such a manner that it raises the ring about the vertical ring bearing housing. When this ring is raised it in turn raises the lever attached to the vertical ring which locks the gimbal ring and rotor in the previously mentioned position. At the same time a small gear attached to the inside end of the synchronizing knob engages an azimuth gear attached to the bottom of the vertical ring and by turning the knob the whole assembly is turned about a vertical axis until the desired heading is obtained. The knob is then pulled out, which releases the gears, the lever releases the gimbal ring, and rotor and its assembly has three degrees of freedom, allowing the rotor to maintain its axis of rotation. This it does except for a small variation due to the slight friction of the bearings.

Now, as the airplane turns in one direction or another, the case of the instrument rotates with the ship around the rotor and its assembly and as the compass card is attached to this assembly, the reading, which is viewed through a small window in the face of the case, changes, without lag or oscillation, according to the amount of turn made. Thus the true heading of the airplane is known at all times and under this condition any amount of turn can be made to the exact degree or straight flight can be maintained.

The small error due to the friction of the bearings is less than three degrees of arc in fifteen minutes and varies somewhat with different instruments, making it necessary to check the reading of the directional gyro with the magnetic compass at regular intervals and resetting the gyro. Whenever the gyro is being synchronized with the compass, care should be taken that the airplane is in normal flight position.

Artificial Horizon

WHEREAS, the Turn Indicator utilized the property of precession of the gyroscope and the Directional Gyro utilizes the property of rigidity as its directive force, the next instrument to be discussed utilizes both of these properties. This instrument is the Artificial Horizon.

This instrument allows a pilot to fly as he is accustomed to by simulating the earth, sky and horizon and the face of the instrument in such a manner that he gets visual flight stimuli similar to that which is re-

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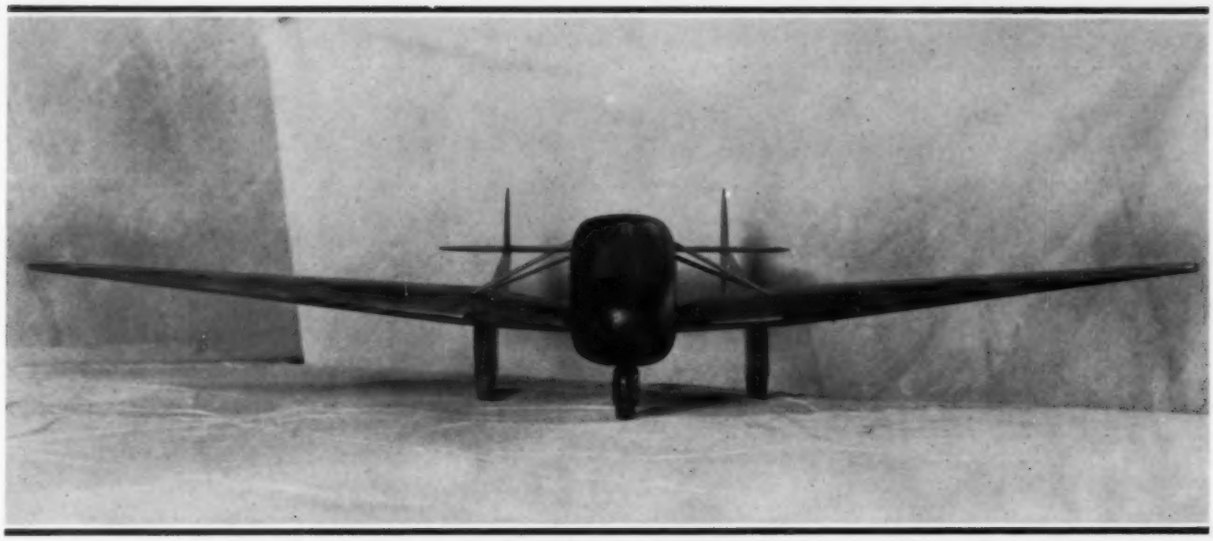


A wind tunnel model of the Hammond Model Y pusher type, Menasco powered monoplane whose specifications have been accepted by the Bureau of Air Commerce from the recent bids for fifteen safe, easily-operated, low-priced airplanes for the use of the Bureau's aeronautical inspectors.

The Hammond Model Y

Pusher Type, Menasco Powered Monoplane Meets D.O.C. Specifications

By Dean B. Hammond

THE Hammond Model Y has been designed to meet what the Hammond Aircraft Corporation believes to be the needs of the private flyer as well as meeting the specification AB-205. It has been developed for the novice pilot utilizing as few controls as possible. The existing controls are simple and easy to operate.

No complicated or untried devices or types of construction which might prove impractical, experimental or tend to increase maintenance costs have been used to obtain the specified performance.

The Model Y is a two-place side-by-side, closed, pusher type monoplane. It will be powered with the Menasco four-cylinder inverted in line engine. The fuselage will be of all-metal construction. The plane will be equipped with starter, generator, and liquid storage battery. Provision has been made for forty pounds of baggage and a parachute for each passenger.

The plane is equipped with a three-wheel landing gear which absolutely prevents nose-over on landing, and which allows the plane to be landed at its stalling speed or up to its cruising speed. The landing gear arrangement eliminates the danger of ground looping. The airplane can be landed cross wind and, without the use of brakes or rudder, will automatically right itself on the ground. The position of the Model Y on the ground is such that strong gusts of wind will not lift or damage it.

In taking off, the control can be pushed completely forward, allowing the ship to gather speed. If the pilot sees he cannot clear an obstacle, he can apply the brakes fully and make a short stop without any danger of nosing over. It is impossible to stall the ship on the take-off, even with the stick full back.

The Model Y will have a very steep glide if desired, permitting the plane to land in a very small landing area. If desired, it can be landed by merely pulling the control fully back. There will be no danger of stall in this condition. The speed and rate of descent will be very slow, and the landing carriage will absorb the resulting shock with margin to spare.

The landing speed is about thirty-five miles per hour and the top speed is in excess of one hundred and ten miles per hour. The maximum gasoline mileage is approximately twenty miles per gallon.

The door is near the ground, thus facilitating entrance into the cabin. There is extremely good vision in all directions and in all flying attitudes.

Due to the shaping of the nose, wind noises will be considerably less than in the conventional type airplane. Engine and propeller noises are back away from the occupants. These combined features result in an altogether quiet and comfortable airplane.

Special attention has been given throughout the design to grease and oil fittings, replacable bushings, inspection openings and all factors bearing on the reduction of maintenance costs.

Manhattan's First Municipal Airport

Exponents of Water Flying Find the Answer to the Problem of Metropolitan Inaccessibility in the Development And Construction of Waterway Air Terminals

By George B. Post *

DURING the past summer an activity has been taking place at the foot of Wall Street and the East River, which bids fair to alter the whole conception of airline terminals for New York and other waterfront cities. It is known as the Wall Street Sky Port and incorporates a number of novel and interesting innovations in the way of seaplane facilities. The base is designed to serve as a terminal for two distinct classes of water flying: organized air transport operations with relatively large (twelve to eighteen-passenger) seaplanes; and the parking problem for small, privately owned seaplanes and amphibians.

In the former category would logically fall airline operations, such as between New York, Philadelphia and Boston; commuting services to the suburban waterfront communities; shuttle services to Floyd Bennett Field and the Newark Airport; and last, but by no means least from the standpoint of profit—sightseeing flights around Manhattan Island. In the private class is included the increasing number of Long Island's north shore commuters who come by plane instead of boat and wish to leave their ships at the base for the greater part of the day; together with the privately owned ships from more distant points whose owners have Manhattan Island for their objective and who appreciate the opportunity to fly all the way instead of struggling in from a distant airport.

Handling the big ships with efficiency and dispatch was the problem. For in contemplating ten-minute sight-seeing trips, mixed in with a six to eight-minute shuttle service to Newark Airport or Floyd Bennett Field, it immediately becomes apparent that the conventional method of taxiing gently up to a float, making fast and turning about with the help of many hands would never prove practical. The solution was found in an ingenious 80 x 45-foot barge with a sloping turntable built on the off-shore end and partially submerged in the water. A ten horsepower electric motor is used to rotate it at will in either direction. With its slope of eight to one, the turntable shows a draft of some thirty-six inches on its lower periphery, when the lower half is entirely submerged (so as to bring the water line up to its center).

SO ARRANGED, the largest seaplane may come barging up the slip with ample control over wind or current and run hard aground on its smooth planked surface with the keels of its floats. The gentle slope has been shown to give comfortable decelerations at even excessive taxiing speeds, so that there is no need to waste time and risk loss of control by attempting an eggshell landing. When the pilot feels his ship ground, he holds half throttle with the stick well forward. Thirty seconds later his ship has been turned completely around on the turntable and in the same operation raised some two feet out of water. Passengers load or disembark, the throttle is opened and the floats slip gently down on their keels as the ship taxies back into the water.

New York & Suburban Airways have been operating at the base for a six-week period with a ten-passenger single-engine Bellanca Air Bus on floats and it is confidently felt that the elapsed time from landing to discharge of passengers was no more than would be found at the average airport. Of much greater interest, however, is the fact that the barge, in addition to serving as a loading ramp, gives direct access by means of comfortable gangways to an attractive waiting room, fitted with all the modern conveniences and built on the bulkhead, *exactly seventy-five feet from Wall Street!*

Provision is made on the barge for servicing ships with fuel and oil. It is equipped with an electric winch and snatch-blocks and cable for emergency use. Furthermore, variable bouyancy tanks, controlled by compressed air, are built in on the lower end so that the entire slope can be raised out of water in a few minutes' time should there be occasion to completely dry-dock a ship for emergency repairs. Providing facilities for the small-size private and commercial ships proved infinitely simpler and cheaper. A floating catwalk was constructed on steel barrels—six feet wide and some four hundred feet in length; floating a foot above water. It is strung along the northerly side of the pier, held off some twenty-five feet with a series of suitably braced booms which hinge to the pier so as to be free to swing up and down with the tide. The catwalk is fitted with mooring cleats and a padded outer edge so that ships may safely lay alongside for as long as desired while a gangway to the main barge provides passengers with ready access.

TO air-minded Mayor LaGuardia and F. W. Zelcer, his energetic Deputy Commissioner of Aviation, goes the credit for final consummation of the oft-discussed plan. The original layout was conceived and drawn up by the Edo Aircraft Corporation, seaplane

*Vice President, Edo Aircraft Corp.

manufacturers of College Point, in collaboration with engineers of United Dry Docks, Inc. But it was Zelcer who found the E. R. A. money, secured the facilities of the Brooklyn Navy Yard and enlisted the services of Keith Pevear, who took charge of the detailed design and construction of the entire project.

In six weeks of active use this fall the Wall Street Sky Port has demonstrated its value in convincing fashion. Already a daily average of some fifty people have been using it in sight-seeing or commuting flights. It stands ready as a door-mat to Manhattan Island for ships of the Army, Navy and Coast Guard whenever emergency may require, and is already being used as a background for a number of flying services which will be inaugurated when the season commences next spring. Within a few weeks a sister ship of the Wall Street barge will be placed in operation at Thirty-first Street and the East River to serve the midtown section and another similar base is being planned for use next spring at Floyd Bennett Field to act as a terminal for a shuttle service between the city's mammoth municipal airport and Manhattan Island.

The Wall Street Sky Port—the first municipal airport for Manhattan Island—widely predicted as the solution to the problem of airline terminals for waterfront cities. The new seaplane facilities are exactly seventy-five feet from Wall Street.

WHAT has been done in Manhattan can be accomplished almost universally where water facilities are available. The majority of the nation's greatest cities are adjacent to water. In most cases, the metropolitan areas, the business and residential sections are actually "on the water" and offer suitable areas for water landings. For example, New Orleans, St. Louis and Chicago are not only perfectly arranged for water landings, but are connected by an all-water airway as well. St. Louis, Kansas City and Omaha are linked by the Missouri River. Corpus Christi, Galveston, Houston, New Orleans, Mobile and other gulf coast cities could be practically linked with proper water landing equipment with the Florida coast.

Experience has taught us that for ordinary use a simple float and the availability of aviation gas is all that is required. The float should be not more than a few feet above water and, of course, should have no obstruction above the surface that would permit injury to the wings. It should be secured away from the pier or bulkhead line by thirty or more feet so that the ship can be easily brought alongside and again, that there be no hazard of wing damage. A little padding with automobile tires and a ladder up to the bulkhead line complete the dock facilities. It is apparent that the investment would be insignificant as compared to the construction of an airport and yet once it is established and aviation fuel is available, it is possible for owners to really utilize their seaplanes.

The rather elaborate turntable barge which is placed in Wall Street is not essential for ordinary operations. It is only necessary where large seaplanes are to be operated with a minimum loss of time and with a minimum personnel. The larger cities would naturally find it advantageous to have turntable barges available, and here again we find the cost of the equipment is insignificant in comparison with the cost of building an airport.

FUNDAMENTALLY, then the requirements for seaplanes can be classified under two distinct headings. First, proper base facilities should be available to use to the fullest extent the seaplane's inherent advantages of getting one directly to the point where he wants to go—facilities for getting ashore in the very heart of our large and small waterfront cities. The other classification for seaplane requirements is a base where ships can be stored and preferably, placed in a hangar. However, such facilities are secondary since if it is possible for people to use their seaplanes, the demand will naturally arise for a base. The requirements of the seaplane are so seldom understood that when the need arises for hangars at airports close to water the usual mistake is to widely separate the ramp from the main hangars, thereby presenting an unnecessary inconvenience.

The development of better facilities for seaplanes throughout the United States is inevitable. The practicability, simplicity and economy of such a base as the Wall Street Sky Port on Manhattan Island is readily apparent. The serious problems of inconvenience and loss of time in commuting between cities and airports, particularly on the shorter runs, will be given a death blow through the construction of proper seaplane facilities.

On The Record

After five months of operation under the new air mail laws, leaders in the air transport industry come forward to present their views and constructive recommendations to the President's Federal Aviation Commission.

OCTOBER testimony brought forth by outstanding executives in air transportation leaves no doubt in the minds of the public or of the Commissioners regarding just where mistakes have been made, and what is more pertinent, where injury resulting from the new air mail laws and temporary contracts can be remedied.

The concensus of this executive opinion pointed to the fact that should the new air mail laws remain operative through any considerable portion of 1935, the future of the air transport industry would be anything but bright. In the words of Mr. W. A. Patterson, President of United Air Lines, "Unless specific legislation founded on fairness to the Government, the public and the industry, is not passed and becomes law within the first sixty days after the next Congress convenes, the large air transport companies will have reduced their entire cash resources to a point where they will be unable to carry on beyond June 15 without extensive refinancing. Such refinancing will create capital structures that volume of business cannot support, with the result that this new industry will carry this as a burden for many years to come."

Centralized Governmental Control

Everyone, it appears, is anxious to see the establishment of a permanent Federal Aviation Commission. "It is my opinion that the time has been reached in the air transport industry when it should be regulated to a certain extent by a governmental body," said Mr. E. R. Breech, President of North American Aviation, Inc. "The permanent Federal Aviation Commission should have authority to issue certificates of necessity and convenience for established air routes. These certificates should be issued to all existing operators who have demonstrated satisfactorily their ability to operate daily scheduled air transport service over existing routes in accordance with the standards heretofore set by the Department of Commerce," he continued.

Mr. Patterson stated that "An outstanding difficulty with air transportation today is the sudden and complete change in Government policy toward this business." He vehemently suggested the creation of a permanent Federal Aviation Commission with the authority to establish and regulate mail, passenger and express rates; to issue certificates of public convenience and necessity, stipulating a procedure of holding public hearings where all may have an opportunity to register objection to certificates being granted to the applicant; permit any company holding a certificate of public convenience and necessity over a given route to carry air mail; to promote ethical competition before granting a certificate of public convenience and necessity over the identical route or portion of a route previously established; require equipment that represents advancement to equal or surpass that in service, and not an obsolescent design; require that wages and working conditions be not less than those in effect by the existing company; that financial responsibility is such that ability to continue is reasonably assured.

To Mr. C. B. Monro, President of Pennsylvania Airlines "There is little question in our minds that the present Air Mail Act is unfair, contradictory, and discriminatory in its provisions. Its effect is purely destructive." He too asks that legislation "provide for some centralized control, independently organized, to which the industry can look for guidance and supervision in all matters."

Mr. Lester D. Seymour, President of American Airlines at the time his testimony was presented, urged "the establishment of a permanent Federal Aviation Commission or body charged with the complete regulation and administration of federal control and assistance to commercial air transport."

Air Mail Rates and Extent of Government Support

"It is a known fact that no company can operate for an extended period of time without mail compensation," opined Mr. Monro. "A uniform rate of mail compensation cannot be applied to all concerns alike. The question of policy is therefore involved. Does the Government desire to foster and encourage the development of air transportation only over the main trade routes?" he asked. "Or does it consider, as in the case of the merchant marine, the railroads, and in every other branch of its mail service, that the needs of the country as a whole should be served? If the latter premise is true, the permanent Aviation Commission should be empowered to establish graduated rates of mail compensation so as to permit a nation-wide, and not a localized development of air transportation."

Mr. Seymour admitted that it would be impossible at this time to state exactly what the payments should be. Attempts to do so, he points out, have already proven inadequate as, for example, the present limitation to approximately forty cents per mile for the carriage of mail in an airplane, regardless of how much mail may be aboard that plane. "It would appear that

the proper payment must include a consideration both of *pound miles* flown and *airplane miles* flown." The method of payment must be flexible enough for adjustment to meet existing conditions from time to time, he believes.

"A more equitable method," thinks Mr. Patterson, "would be a straight two mills per pound-mile over those routes which provide a volume that would bring a reasonable rate on that basis. There would be no minimum. On the two mills per pound-mile rate, there should be no maximum per mile unless the bill specifically states that there is to be a maximum load which the operators would be required to carry." He believes "that the plan is worth trying for one year, at the end of which an adjustment in rates could be effected."

He admitted the difficulty to apply a specific yardstick or definite formula to produce intelligent results governing all air lines. "The present act attempts to regulate rates. Although the minimum rate in the act is not particularly scientific, I do feel that it provides a reasonable basis of payment for a service over a territory which will not produce sufficient mail revenue to recompense the operator for a service rendered," Mr. Patterson said.

"The balance of the formula, I believe, is extremely unfair," he continued. "A maximum rate is provided with no consideration whatsoever to what the operation will be expected to carry for that maximum rate. It also takes into consideration the average load over all schedules. Mail loads vary from one extreme to the other. Schedules originating during daylight hours usually have light loads, whereas evening departures have extremely heavy loads through the densely populated areas of the country. Under the existing rate formula, the Post Office Department may, if it wishes, turn over to United Air Lines at New York 2,400 pounds of mail for one particular flight. Such a load occupies the entire load capacity of the airplane. There would be no passenger seats available and no room for express. Under the existing contract we would be paid 40c per mile for the performance of that trip, even if it so happened that two earlier schedules on which, however, we had to set aside space for mail, went out light." He further pointed out that the company would be compelled to fly an airplane for 40c that costs on an average for the year of from 58c to 60c per mile to fly.

Mr. Breech stated that the matter of air mail rates should be determined by the permanent Commission after a thorough study of the facts and figures relevant thereto, and that it would be possible to eliminate government subsidy of air lines within a period of the next five years. "It is my feeling," he said, "that the Government's income from postage on air mail within a few years would cover the Government's entire payments to all air lines as a whole. It is my strong recommendation that all air mail operators should be paid for the carriage of air mail under the same formula, and that this formula should have some relation to the postage revenue from air mail letters." He believed too that subsidy payments to such air lines requiring it should not be made by the Post Office Department, but rather should be provided by Congress for the purpose.

Bids

An answer to the question of why companies now carrying the mail bid such low prices when domestic routes were reopened to competitive bids was afforded by Mr. Seymour. "They were forced to do so to preserve their investments along the routes which they have been flying, to provide usefulness for aircraft in which they already have large investments, or to protect undelivered aircraft for which they were committed to manufacturers and the orders for which could not be cancelled. Probably the most important reason influencing companies to bid rates for the carriage of mail so low in many cases as to obviously bear no relation to compensation for services rendered, was their belief and faith in the fairness of action which would finally be taken by their Government and the necessity of protecting investments already made against that time when it would be definitely known under what final arrangements air transport and air mail services would operate."

Mr. Carleton Putnam, President of Pacific Seaboard Air Lines, Inc., stated that he saw no conflict between the principle of competitive bidding and the principle of a subsidy. It was pointed out that the entire air mail mileage of the country was thrown open to competitive bidding in order to correct, as far as possible, such abuses as may have occurred, and to provide a belated opportunity to the smaller companies whose progress had been blocked. Every operator was therefore given the opportunity of undertaking a mail service, according to its capacity, in the first round of bidding, before it had become known that the new law would authorize rate changes. In this way, it was explained, the Administration took what was apparently the only method of redeeming the injustices of the past and of re-establishing all of the operators of the United States on an equitable basis within the industry.

Pacific Seaboard therefore considers it to be the part of wisdom to approach the problem of the future as one entirely fresh and unconnected with any policies or expedients which may have been found appropriate to the past. However, it considers the principle of competitive bidding in conflict with the principle of rate regulation by the Interstate Commerce Commission, into whose hands Pacific Seaboard desires the rate-making power to be delivered.

Mr. Breech recommended that the Post Office Department should be authorized to place air mail on all air lines to whom certificates of public necessity and convenience shall have been issued by the permanent Federal Aviation Commission, in much the same manner as the carriage of mail is performed by the railroads today. "It follows naturally that such a procedure will eliminate the necessity for competitive bidding for air mail contracts, since the permanent Federal Aviation Commission would be empowered to issue certificates of public necessity and convenience and also regulate all rates for the various types of cargo," he said.

Corporate Affiliations

Mr. Breech pointed out that the separation of air transport companies from manufacturing and holding companies would appear undesirable and not in the best interest of a young industry that must obtain the necessary capital for the inevitable expansion. "I know

(Continued on Page 30)

Above: Jimmy Doolittle and the completely modernized Wasp-powered Orion "Shellightning," two familiar visitors to many Southwestern airports, snapped at the Lockheed factory in October after completion of a thorough overhaul and installation of new equipment.

Right: Billy Parker, Chief of Phillips Petroleum Company's Aviation Division, inspects his "Flying Laboratory," the specially ordered Orion which was delivered by Lockheed in October. On the flight from Los Angeles to Oklahoma City Parker clipped time off the established record, making the 1,400 miles in five hours and ten minutes.

Two Orions

Incorporating some of the latest developments in flight equipment, two famous Lockheeds spread the gospel of practical aviation.

Phillips' New Lockheed

WHEN Billy Parker, Phillips Petroleum Company's chief pilot and head of the Aviation Division, brought the new four-place Cyclone-powered Orion to headquarters in Bartlesville, Oklahoma, early in October, he made the 1,400-mile trip from Los Angeles in five hours and forty-five minutes with stops at Albuquerque and Oklahoma City. His five hour and ten minute flight to Oklahoma City broke the existing record of five hours and fifty-nine minutes held by Luther Gray, who in turn had wrested the honor from Wiley Post.

Phillips' new Orion is a veritable "flying laboratory." Equipped with numerous temperature-indicating instruments, it will be used mainly for testing aviation fuels.

In equipping the new Orion as a "flying laboratory," the Phillips research department under the direction of R. S. Alden is undertaking to demonstrate the effectiveness of the most practical cure for carburetor ice formation, namely, to controllably preheat the air taken into the induction system.

To accomplish this, Billy Parker has designed a special heater to controllably heat the intake air. As a basis of comparison, the heater will be used in conjunction with the regular stove which heats the air-gasoline mixture. In addition, numerous temperature instruments are being installed to determine the temperatures in the induction system under which carburetor ice formation is caused and eliminated.

Its Wright Cyclone develops 550 h. p. at 1,000 feet and 650 h. p. at 9,500 feet. Incidental features include controllable pitch propeller, retractable landing gear, wing flaps and a Westport beam and weather radio.

"Shellightning" Modernized

UNDERGOING complete overhaul and modernization at the Lockheed shops in Burbank, California, Major James H. Doolittle's famous "Shellightning" is again based in St. Louis in service of the Shell Petroleum Corporation. The Orion, several years old, has been completely modernized. Improvements include soundproofing such as employed in the bi-motor Electra airliner, split type wing flaps and the latest type of landing gear which embodies an improved oleo shock strut.

The 300-gallon gasoline capacity gives the Orion a cruising range of 1,450 miles. It was in this plane in 1932 that Doolittle made his historic 2,900-mile flight in one day over the complete route covered by George Washington in the Revolutionary War campaigns. Wright powered, the "Shellightning" has been flown by Doolittle on his many inter-city speed flights.

Painted in the brilliant Shell yellow, the Orion is one of the most colorful pieces of equipment based in the Southwest and is used extensively by the petroleum company not only in furnishing speedy means of executive transportation but in the testing and merchandising phases of Shell's aviation products.

WASHINGTON

P. T. NORTON, JR.

The Federation Aeronautique Internationale

President-Prince Bibesco of Roumania pays tribute to U. S. fliers in the opening address.

Wiley Post presented Gold Medal for Round-the-World flight as Outstanding 1933 Event.

IN AN impressive international atmosphere, the Thirty-fourth Congress of the Federation Aeronautique Internationale was formally opened in the United States Chamber of Commerce Auditorium in early October.

Flags of all nations were conspicuous as delegates from a score of foreign countries assembled to discuss the affairs of world aviation.

Personally representing President Roosevelt was Secretary of State Cordell Hull, who greeted the distinguished visitors on behalf of the United States Government.

The Congress was formally opened with the speech of Prince Georges Bibesco of Roumania, president of the world federation, introduced by former Senator Hiram Bingham, president of the National Aeronautic Association (U. S. affiliate of the F. A. I.)

Lauding the pioneering achievements of Orville and Wilbur Wright and the aeronautical progress of the United States in the years since, Prince Bibesco saluted Secretary Hull and pointed the way for the events which were on the colorful program.

Occupying all available seats, members of the diplomatic corps, high government officials and aviation leaders witnessed the ceremonies.

The Prince-President spoke in French, easily followed by fellow delegates and diplomats. For the radio audience, an announcer read a translation of the speeches into the microphone.

Following the opening ceremonies awards were made for outstanding aeronautical achievements during 1933.

To Wiley Post was awarded the gold medal of the F. A. I. for his solo flight around the world in the Winnie Mae—18,500 miles in eight days.

Previous recipients of this award have included Col. Charles A. Lindbergh, Marshal Italo Balbo, and Dr. Hugo Eckener. Post did not come to Washington to receive the medal personally.

To Balbo for his mass flight from Italy to the United States was awarded the Count de la Vauix medal in gold, created in memory of the late F. A. I. President.

Three silver medals, dedicated to the same patriot, given annually to pilots establishing maximum performance for speed, altitude and distance, were then presented in absentia:

To France's Codos and Rossi was awarded the medal for distance in observance of their flight from New York to Iraq, 5,657 miles.

In their absence it was given to Louis Bleriot, pioneer French aviator, who designed and built the record-breaking plane.

For obtaining the greatest speed known to man—438.8 miles an hour—Francisco Agello, of Italy, was awarded a similar medal. In his absence it was accepted by Duke Della Vittoria Diaz, president of the Royal Italian Aero Club.

And to Lieut. Commander T. G. W. Settle and Maj. Chester Fordney, of the United States, was awarded a silver medal for their balloon ascension last fall to a height of 61,236 feet.

All subsequent sessions were of an executive nature, closed to press and public.

President and Mrs. Roosevelt opened the White House to the distinguished guests at a reception and tea. Formal receptions at the various embassies occupied the evenings.

The delegates were flown to Langley Field, Virginia, where they inspected with approval the laboratories of the National Advisory Committee for Aeronautics.

Giant Sikorsky Cruisers Designed

GIANT air cruisers capable of carrying fifty-five passengers and 1,000 pounds of mail and express are being designed for transoceanic service, Igor Sikorsky, famous aircraft designer, told the Federal Aviation Commission in October.

The same planes, converted into military bombing types and carrying 20,000 pounds of bombs each, could reduce a city like New York to ashes while operating from aircraft carriers 1,000 miles at sea.

Frank Hawks, celebrated pilot, told the Commission that with present available equipment a fleet of enemy planes could fly from Alaska to New York, nonstop, and drop a ton of bombs or a huge quantity of poison gas. The planes would be unable to make the return flight, but there are plenty of subjects of other countries who would willingly give their lives in accomplishing such a feat.

Stressing the importance of higher speed aircraft for military use, Hawks said our air force "should have their eyes on Alaska and the Aleutian Islands, as well as Hawaii and the Philippines for the protection

of not only the West Coast, but the East Coast as well."

The picture Sikorsky painted of the possibility of New York City's destruction by aerial attack was prompted by questions from Chairman Howell. Sikorsky told of plans of his organization for building great air cruisers which, he claimed, would weigh 116,000 pounds, have a flying range of 4,600 miles at nearly 200 miles per hour, and permit a pay load of 55,000 pounds. They would have dining and sleeping accommodations.

He stated as his preference the use of flying boats of long flying ranges rather than resort to landing on seadromes for refueling.

The ship he envisioned would make a piker of the now-greatest Maxim Gorky.

Senator McAdoo, N. A. A. Prexy

WILLIAM G. McADOO, United States Senator from California, was the official nominee for president of the National Aeronautic Association when that organization elected officers recently.

He was designated as the presidential nominee at a former meeting of the nominating committee of the N. A. A., headed by William P. McCracken, Jr., the chairman.

The designation of McAdoo was designed to head off a bitter election battle between Bernarr Macfadden and Hiram Bingham, former president.

Macfadden, publisher and aviation enthusiast, had a split with Bingham two years ago and resigned from the association. He rejoined recently after his friends had prevailed upon him to run for the presidency.

No fewer than half dozen men had been mentioned for the role of N. A. A. president.

McAdoo said the nomination came as a complete surprise to him. He is one of America's outstanding flying enthusiasts and does most of his traveling in his own plane.

Two men who have run afoul of Congress—General Foulois and "Bill" MacCracken—were applauded when they appeared at a session of the N. A. A.

The convention adopted a timely resolution for the establishment of a landing field at Kitty Hawk, North Carolina, scene of the Wright brothers' first flight.

Early Aviation Films Shown Here

Flying's Infancy Shown in Reel Collection of M. Bleriot

THE former United States Ambassador to the Argentine, Mr. Robert Woods Bliss, and Mrs. Bliss were recent hosts at their home in Georgetown at the informal showing of films by M. Louis Bleriot, French delegate to the Congress of the Federation Aeronautique Internationale.

Originally the Alliance Francaise of Washington had planned to entertain a large and distinguished group of guests at the Carlton Hotel to view the films of the early development of aviation, assembled by M. Bleriot, who was the first man to fly the English Channel. However, the untimely death of King Alexander I of Yugoslavia, which put an end to the entertaining of delegates to the F. A. I. Congress, also canceled plans of the alliance because of the death at the same time of the Foreign Minister of France, M. Louis Barthou, who was honorary president of the Alliance Francaise.

Mr. and Mrs. Bliss, who were interested in the precious films, immediately offered their beautiful home, Dumbarton Oaks, for the occasion.

Owing to the more limited space, only 150 guests were invited to this private-home showing.

M. Bleriot does not often exhibit these pictures because of their great age and fragility, but a number of the delegates to the air congress as well as Army and Navy people were present.

After early studies in flying under Orville Wright, M. Bleriot broke all former world speed records. His record, which stood for a long time, was 35.5 miles per hour.

Approves New Air Route to Orient

Expansion of American trade with the Orient, benefitting especially California and other West Coast states, was foreseen as resulting from the projected transpacific airmail route of Pan American Airways, Inc., by Senator McAdoo. Said he:

"I believe that with modern flying equipment a transpacific line will be successful. It will mean a great deal to the business men of America and those of the Orient to have airmail and speedy travel made possible."

Wife of Vidal Heads Air Meet

MRS. EUGENE VIDAL, wife of the Director of of Air Commerce, headed the list of patronesses for the "all-women's" air meet which was held recently at College Park, Maryland, suburb of Washington and seat of the University of Maryland.

The meet was a colorful and spectacular affair and those of the fairer sex were the whole show.

The wisest remark made during the meet was that of one of the "sportswomen pilots." Said she: "Aviation is a great thing for women. It is a wholesome and invigorating sport. However, women should keep it a private and sporting matter, and never attempt to squeeze the well-deserving professional men out of their jobs."

Other patronesses of the meet were our Madam "Moguls of Aviation" Vide: Signora Sbernadori, wife of the air attache of the Royal Italian Embassy; Mme. Champsaur, wife of the air attache of the French Embassy; Mrs. Benjamin D. Foulois, wife of the Chief of the Air Corps; Mrs. J. Ernest J. King, wife of the Chief of the Bureau of Aeronautics of the Navy; Mrs. Hiram Bingham, wife of the past-president of the National Aeronautical Association; Mrs. G. W. Lewis, Mrs. John F. Victory, Mrs. L. J. Briggs, Mrs. Oscar Westover, Mrs. H. C. Kress Muhlenberg, Mrs. Ray Cooper, and Mrs. J. Carroll Cone.

Aircraft 1934

The long range Bellanca 28-70 racer with a cruising speed of 233 miles per hour is noted for its load carrying ability. Formidable contender for the speed section of the MacRobertson Race, the "Irish Swoop" was withdrawn by Col. James C. Fitzmaurice, when the Race Committee required its gasoline load be disposed to such an extent that 1,000 miles would have been cut from its cruising range.

Bellanca Model 28-70 Racer

ALTHOUGH she did not compete in the race for which she was primarily designed, the Bellanca built Model 28-70 "Irish Swoop" sets a new goal in aeronautic development. Especially constructed for the use of Colonel James C. Fitzmaurice in the MacPherson Robertson Race from London to Melbourne, the new design is also of particular significance since it is similar to a plane that will soon be offered for commercial use and operation by the Bellanca Aircraft Corporation.

According to figures released in October by the manufacturer, the "Irish Swoop" has a cruising speed of 233 m. p. h. at 9,000 feet. Maximum speed at the same altitude is 257 m. p. h. Rate of climb is 1,980 feet per minute. Cruising range with 7,000 pounds gross weight is 2,075 miles; with 8,350 pounds gross weight, 3,365 miles. Fully loaded for such a 3,000-mile long distance hop, the 28-70 meets all of the U. S. Department of Commerce and the International Committee for Air Navigation load factor requirements. Thus it has sufficient range to span the Atlantic Ocean non-stop, and carries a larger weight of useful load than the plane itself empty.

General: The Bellanca Model 28-70 is a high-performance long-range low-wing braced monoplane, complete with retracting landing gear and powered with the twin-row geared Pratt & Whitney "Wasp Junior" engine of 14 cylinders.

Wings: The wings are tapered in plan form, and taper in thickness near the tip, being of two-spar construction. They are braced by a system of tie-rods to the fuselage on top and to two special designed steel supporting struts extending below the fuselage. The tie-rods are so positioned as to make space for the clearance of the wheels when they are retracted. Wing ribs are closely spaced, and the whole wing covered with fabric, the surface being finished to a high gloss. Latest type of landing lights integral with the leading edge of the wing are provided.

Fuselage: The fuselage structure is of chrome molybdenum steel tubing, being faired with spruce fairing strips, the whole being covered with fabric. A feature of the fuselage construction is the method of suspending the 600-gallon gasoline supply in a cylindrical unit of two tanks, the tubes of the fuselage structure running through the tanks in especially prepared channels at various places. In this manner, the greatest gasoline capacity was incorporated in the smallest possible space, every unit being utilized to the utmost. The fuselage from the power plant to the rudder is almost of perfect streamline form, thus diminishing drag and increasing the efficiency of the plane.

Landing Gear: The landing gear is of the retracting type, the loads being distributed over a triangular truss arrangement, two sides of which are formed by the vee-shaped landing gear legs, while the third consists of a chrome molybdenum welded tubular member running cross-wise between the two wing spars; one of the landing gear legs incorporates an oleo shock absorber. The wing spars at the point of landing gear attachment and extending in to the wing are very thick and sturdy to take care of the combined landing and flying loads imposed. The retracting arrangement is by means of a positive drum and cable mechanism. The locking arrangement for the landing gear unit is a separate and distinct feature from the retraction

devices, being worked by an Arens cable control, and a steel pin of ample dimensions is thrust through a hole in a lug on the landing gear leg, thus forming a positive and trustworthy locking device. The wheels are of the standing Bendix airplane type, and are fitted with 32 x 6 smooth airplane tires. Bendix brakes are used, and in order to simplify mechanical features, the hydraulic brake control system was chosen, due to its adaptability in making short bends, etc., and working positively in connection with the retraction feature of the landing gear. The wide tread of the landing gear makes for taxiing ease, as well as better and more steady control during heavy load take-off. The tail wheel is recessed with the tubular fuselage structure, and is non-swiveling, consisting of a full balloon tail wheel with streamline cuff. This feature of the fixed tail wheel also increases the directional control and stability of the plane during taxiing before take-off.

Power Plant: The power plant consists of one Pratt & Whitney geared twin-row 14-cylinder "Wasp Junior" engine, developing 700 horsepower at 2,500 r. p. m. at 8,900 feet altitude. The propeller is a two-blade Hamilton-Standard Controllable of 10 ft. 6 in. diameter. An oil cooler is incorporated in the leading edge of the wing, and an auxiliary oil cooler with scoop is located to the rear of the engine cowl. The engine ring cowl is of the latest full N. A. C. A. type, made in two parts for ease of servicing the engine. The engine is shielded for radio. A forty-gallon oil tank is provided just to the rear of the power plant compartment.

Empennage: The tail group of the Bellanca Model 28-70 is particularly noteworthy. The stabilizer is tapered in plan form and plywood covered, the whole being highly polished to a gloss finish; stabilizer adjustment is eliminated through the use of tab controls on the elevators. These elevators are dynamically balanced, being of chrome molybdenum welded steel tubular structure with fabric covering. Likewise the rudder is of chrome molybdenum steel tubing structure with dynamic balance and rudder trim tab. The fin is of wood structure, plywood covered, and highly polished. This type of tail structure is unusually rugged and sturdy. All controls operate on ball bearings.

Cockpit: The cockpit of the "Irish Swoop" has provisions for two men with parachutes, sitting in tandem fashion in all-metal bucket-type shock-absorbing and self-adjusting Bendix seats. The front cockpit contains complete navigation and engine instruments, controls for plane and engine, landing gear retraction control and mechanism, dump valve cranks, etc. The rear cockpit contains simplest navigation and engine instruments in addition to a directional radio receiver, controls, etc. The entire cockpit cover from the windshield to the fin is quickly detachable during flight by use of a safety-clip device, one of which is accessible to either pilot or co-pilot.

Boeing 247-D

(See Front Cover, Southwestern Aviation for October, 1934)

OCTOBER saw the completion of flight tests of the Boeing Model 247-D Transport at Seattle. Showing a top speed of 200 miles an hour and an ability to climb as high as 11,000 feet on either one of its two engines, the new model shows increased performance and many new features not incorporated in its predecessor, the 247.

The 247-D is equipped with two geared supercharged 550 horsepower Pratt & Whitney Wasp engines and three-bladed Hamilton Standard controllable pitch propellers. On the predecessor, direct-drive Wasps and two-bladed controllables were provided. In its recent test the plane's cruising speed at 12,000 feet was 189 miles per hour and, at 8,000 feet, 180 miles an hour. It climbs from sea level at the rate of 1,150 feet per minute and has an absolute ceiling of 27,200 feet. Its cruising range, without refueling at 75 per cent horsepower, is 800 miles.

Because of the high strength factors demonstrated by the 247, the new plane has been licensed for a gross weight of 13,650 pounds with a pay load of 2,582 pounds, including ten passengers, baggage and cargo.

There is an increase of 187 per cent in its single-engine performance as compared with the Model 247, its single-engined ceiling of 11,500 feet compared to 4,000 feet for the earlier type. The Wasps in the new model have a blower gear ratio of twelve to one and a propeller gear ratio of three to two.

Cabin quietness has been materially increased by the use of new-type insulation in the cabin and pilots' compartment and by the elimination of individual ventilators and the reduction of propeller tip noise. A hot air heating system capable of maintaining a comfortable temperature at all altitudes has been adopted. The new ventilating system permits a complete change of air in the cabin every forty-five seconds. Improved head rests on the adjustable reclining cabin chairs have added much towards passenger comfort.

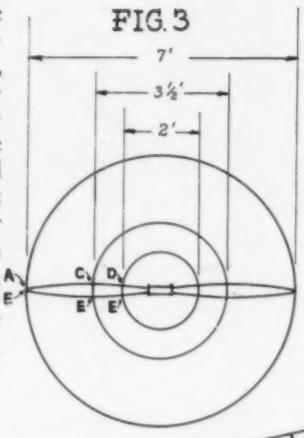
Flush type rivets have been used around the leading edge of the wing and stabilizer. The elevator and rudder are of metal construction, fabric covered, rather than the all-metal construction as on the original 247's. The trailing edge flap built into the rudder is of the divided type, with the top half acting as an aerodynamic balance and the lower half serving as a trimming flap. Other improvements have been made which facilitate maintenance and servicing features.

"Not Too Technical"

Function of Propellers (Part II)

By George Carroll

THE fundamental principles and function of the propeller having been discussed in the October issue, we have sufficient background behind us to authorize a more comprehensive study of the propeller and the consideration of this unit in coordination with other portions of the airplane. In the accompanying diagrams, which should be carefully studied, certain features of the propeller's actual operation will become apparent.



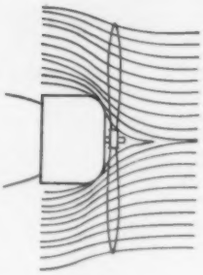


FIG. 1

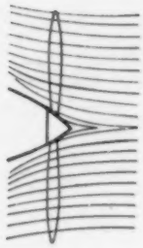
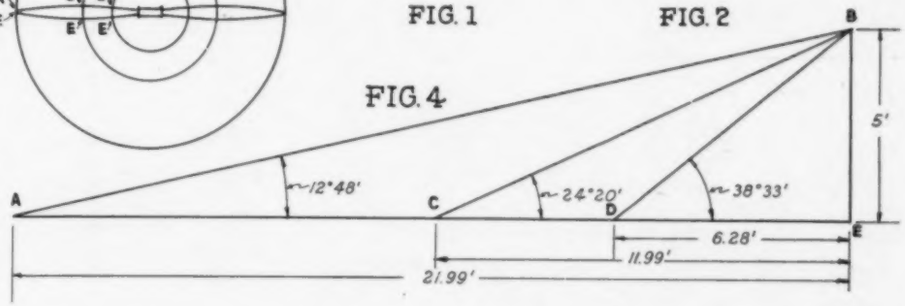


FIG. 2



Analogy to the Wing

An interesting and informative comparison between the propeller and the wing can be made, for the propeller is considerably more than just an "air screw." In fact, it may be visualized as an airfoil, or wing, traveling a circular course instead of in a straight plane. The pitch of the propeller is comparable to the incidence of a wing. Even the conditions surrounding the propeller traveling through the air at a high rate of speed are similar to the conditions surrounding the wing as it passes through the air at sufficient speed to produce lift. In this analogy the reduced pressure area beneath the wing's surface is comparable to the high pressure area attendant to the back side of the propeller blade. The reduced pressure or partial vacuum area on the upper surface of the wing is similarly found in front of the propeller blade.

Variable Pitch

It is evident that since the propeller is traveling in a circular course, a blade of uniform pitch (that is, one having the same angle of pitch at every station along the blade from hub to tip), would not be practical because the tip travels a greater distance per revolution than the portions of the blade closer in toward the hub. To compensate for this condition, it is necessary to vary the pitch along the blade, the pitch increasing in from the tip to the hub, where the blade will have its maximum pitch.

To illustrate this fact, take for example a propeller seven feet in diameter. Its tip would travel approximately twenty-two feet in one revolution. But at a station half way from the hub center to the tip the distance traveled would be but approximately eleven feet, its equivalent being a propeller three and one-half feet in diameter. Since the equidistant inner station must travel forward the same distance per revolution as the tip, it is found that this inner station must have approximately twice the pitch as the point of the blade at the tip.

If it were possible to produce a perfect propeller blade we would find that the pitch at the hub center of the propeller would be absolutely parallel to the axis, decreasing in angle outward from its axis. At every station along the propeller of theoretical design, the pitch would closely adhere to precise mathematical calculations; but since it is physically and mechanically impossible to produce a perfect propeller because of the bulk and stock necessary toward the hub for the purpose of inherent strength, the pitch will not adhere to the mathematical calculations at the points near the hub. It is readily apparent that the necessary bulk at the hub of the propeller produces an amount of centrifugal action on the air, forcing the air to travel contrary to the desired effect.

Motors With Large Frontal Areas

Note in Figure 1 the bulk of the motor directly behind the propeller and the resultant flow of air which results in a considerable loss of propeller efficiency since it is evident that a definite compressed area builds up on the frontal area as well as about the propeller hub. Thus the propeller encounters an adverse condition for we have seen how the propeller must "bite" into free air for best results. Notice particularly the compression of the lines which designate the airflow in front of and around the motor cowling.

In Figure 2 we see the considerable elimination of the compression about the hub of the propeller and the frontal area of the motor and cowling due to the

(Continued on page 29)

News Briefs

Notes From the Industry at Large

Texan Heads American Airlines

C. R. Smith, former vice president of American Airlines in charge of the Southern Division with offices in Fort Worth, has been elected president of that company to succeed Lester D. Seymour, resigned. Smith's headquarters hereafter will be in Chicago.

Smith has been identified with aviation in the Southwest for many years. When A. P. Barrett formed the Texas Air Transport, Smith joined the company as general manager. The company was later expanded to Southern Air Transport, which was subsequently purchased by Aviation Corporation, Smith retaining his position as vice president and general manager of the Southern Division. In 1930 the company became American Airways and Smith continued to direct activities in the South and Southwest. He is one of the few officials to remain in an executive station since the complete reorganization was effected after cancellation of the mail contracts when American Airways became American Airlines.

Hammond Awarded Contract

The Hammond Aircraft Corporation of Ypsilanti, Michigan, has been awarded the contract for the new easily operated civil airplane for the use of the Department's aeronautical inspectors. From fifteen to twenty of the airplanes will be purchased instead of the original twenty-five so that a portion of the funds available will be used in further experimenting with other types brought forward in the competition. The contract was awarded the Hammond Company on the basis of specifications issued by the Bureau in May, bids for which were opened August 27.

The first plane manufactured under the contract is to be delivered for acceptance at the manufacturer's plant within five months after receipt of order. The remaining planes shall be delivered within four months after acceptance of the first ship. They are to cost $3,190 each.

It was officially stated that the prices which the Bureau is paying for these planes do not at this time enter directly into the endeavor to reduce the costs of private airplanes, but that it was felt that a substantial reduction in the cost of airplanes can be brought about only by volume production, which is not involved in this contract.

United's Questionaire

The changed attitude of business men toward use of air passenger and express service in three years is reflected in the compilation of answers of 630 firms to similar questionnaires sent out in 1930 and again in 1934, as released by United Air Lines. Replies to the 1934 questionnaire indicate a more definite interest in air travel and express. More air mail is also being used in routine business transactions.

In 1931, thirty per cent of the firm's representatives answering the questionnaire said that they, or their executives, had traveled by air, and forty-two per cent this year. The same firms reported their employees had more than doubled the volume of air transportation purchased in seven months this year over 1931.

In answer to the question, "Do you travel by air on business?" fifty-three per cent answered in the affirmative this year as against thirty-one per cent in 1931.

To the question, "Do you encourage your sales staff to use air transportation?" forty-one per cent said "Yes" in the 1934 questionnaire, against twenty-one per cent in 1931.

Answering the question, "Do you intend to make greater use of air travel in the future?" fifty per cent replied affirmatively.

Fifty per cent of the 630 firms replying reported an increasing use of air express.

Martin to Europe

Rex Martin, Assistant Director in charge of air navigation, departed October 10 from New York as an official American delegate to the International Aeronautical Exposition to be held in Paris from November 16 to December 2.

In addition to attending the exposition, Mr. Martin has prepared an itinerary that calls for a thorough study of aeronautical development in Europe as it applies to civil and commercial aviation.

Before sailing, Mr. Martin declared that international airplane and airship service is certain to occupy a prominent place in the future and that the nation that leads in air transportation has a better chance of obtaining its fair share of world commerce.

Mr. Martin visited England for the start of the London-Australia air race. While in England he will make a detailed study of the highly-effective system of airport traffic control at Croydon, London's air terminal, which employs methods of directing aircraft in foggy weather that have not been adopted thus far in this country.

He also will inquire into the development of the radio compass and the long-distance operations of Imperial Airways and the aids to air navigation it employs. He then will fly to Amsterdam and study the 10,000-mile air service that connects Holland with its possessions in the Far East, and also learn further of plans of the Dutch air line for a North Atlantic air service.

In Germany he will visit Friederichashafen, on invitation of Dr. Hugo Eckener, to inspect the new Zeppelin LZ-129 now under construction. From Berlin he will fly to Moscow and undertake a first-hand study of Russian aviation development, and thence to Italy, where particular attention will be given to the large horsepower aircraft engines that have been developed by Italian interests.

Advisory Board for I. A. O.

Mr. Bernarr Macfadden, publisher and aviation enthusiast, and also Chairman of the National Advisory Board of the Independent Aviation Operators of the United States, has announced the names of the following men who have accepted his invitation to serve as members of the Advisory Board:

Colonel Theodore Swann of Alabama,
Colonel W. Jefferson Davis of California,
Major C. C. Moseley of California,
Mr. C. S. (Casey) Jones of New Jersey,
Colonel L. P. Bonfoey of Illinois,
Dr. John D. Brock of Missouri,
Mr. Fred D. Fagg, Jr., of Illinois,
Mr. Robert Renfro of New York,
Mr. Henry King of California,
Mr. John Wentworth of Illinois,
Honorable William McCraw of Texas,
Colonel W. E. Easterwood of Texas.

This group of very well known men met at the Mayflower Hotel, Washington, D. C., on October 9 for the purpose of assisting the Independent Aviation Operators in formulating a definite constructive program for the ensuing year. Most of the members of this Advisory Board are not actively engaged in commercial aviation enterprises but are thoroughly interested in its future development and progress.

The Independent Aviation Operators was organized for the purpose of promoting private and miscellaneous flying and to encourage proper service, maintenance and instruction, both from a commercial aviation standpoint and from the standpoint of national defense. The group is now composed of 1,500 members throughout the United States, representative of the commercial aviation industry.

Post Plans More Stratosphere Flights

While Wiley Post is spending a few weeks bear hunting in Alaska, engineers are rebuilding the powerful supercharger in his famous round-the-world Lockheed Vega, the "Winnie Mae," in preparation for further high altitude flights above Chicago.

During recent tests, Post took his Vega up to 40,000 feet, with the aid of two superchargers in series and an air-tight "stratosphere suit." At this altitude, Post said his Wasp was developing in excess of 400 horsepower, which gave him an estimated speed of 300 m. p. h. Between 38,000 and 40,000 feet, the Vega was climbing at a rate of 1,000 feet per minute.

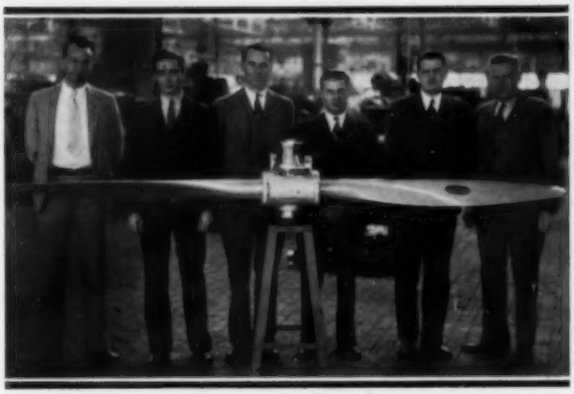
Post gave up his MacRobertson international air race plans in order to continue his efforts to establish a new world altitude record.

Lockheed Names New Superintendent

Richard von Hake, engineer and pilot, has been named factory superintendent of Lockheed Aircraft Corporation, Burbank, California, succeeding Otto Santoff, who has been placed in charge of customer-service. Von Hake was chief engineer of the Lockheed company under the previous management.

Another change in the shop personnel at Lockheed has been the appointment of E. Morton Bach as foreman of the Electra final assembly department. Bach was former head of the company which built Bach trimotor airliners.

One Thousand Controllables



Pictured above is the 1,000th controllable pitch type propeller just recently produced by the Hamilton Standard Propeller Company and scheduled for delivery to the U. S. Navy.

The individuals in the group are, reading from left to right: F. G. Mesny, Naval Inspector; Erle Martin, Assistant Chief Engineer of the Propeller Company; S. A. Stewart, Vice President of the Propeller Company; Lt. F. B. Johnson, Inspector of Naval Aircraft in Hartford; Raycroft Walsh, President of the Propeller Company; and Frank W. Caldwell, Chief Engineer of the Company.

Winner of the Collier Trophy in 1934 as the most outstanding development in American aviation, the Hamilton Controllable was first made available commercially both here and abroad in the spring of 1933. Some of the earlier units have individually accumulated more than 2,000 hours of service on the outstanding domestic airlines. They are now on order for or in use on the planes of commercial airlines all over the world which include SCADTA (South America), KNILM (Dutch East Indies), LAPE (Spain), Avia Linea Mediteranea (Italy), A. B. Aerotransport (Sweden), Deutsche Luft Hansa, A. G. (Germany), China National Aviation Corporation, LOT (Poland), Swissair (Switzerland), Air France, Japan Air Transport as well as the domestic lines embracing United, T. W. A., American Airlines, Eastern Air Transport, Northwest Airlines, Pan American Airways, Pan American Grace Airways, Pacific Alaska Airways, Aerovias Centrales, S. A., and General Airlines.

Air Express Extended

Inauguration of twice daily schedules by Bowen Air Lines between Fort Worth and Brownsville, Texas, extends the nation-wide air express system over which Railway Express Agency operates to give an added link to Latin America, has been announced by J. H. Butler, general manager of the express company.

Direct connections will be made at Brownsville with Pan American Airways System covering Central and South America and the Caribbean area. International Air Express is handled through joint contract arrangements between Pan American and Railway Express. The new link now joins the widespread domestic air express system at another point with the international airline. Also at Los Angeles the air system of the Western Hemisphere meet, while at El Paso and Miami, Fla., connections are effected by fast passenger train express service for expedite handling of International Air Express.

Bowen Air Lines, one of the fourteen air transport companies in the integrated domestic rail-air express system of Railway Express, fiies two schedules daily, one each way between the Mexican border at Brownsville and Dallas and Fort Worth, where connecting airlines of the system carry shipments to all parts of the country.

Douglas Record

Another speed record was claimed by the T. W. A. Douglas recently when it carried a full load of fourteen passengers from Kansas City to New York, a dis-

tance of 1,152 miles, in five hours and forty minutes flying time—one hour and twenty-seven minutes less than its schedule of seven hours and seven minutes and an average of more than 200 miles an hour for the entire trip.

Aerovias Centrales Secures Electra

For the early inauguration of the first multi-motor air service between Southern California and Mexico City, Pan American Airways has taken delivery of the first of six new all-metal, bi-motor Lockheed Electras ordered for use by Aerovias Centrales, S. A. (Central Airways of Mexico), an affiliate of Pan American.

Powered with two Wasp SC-1 engines, Pan American's Electra is new model 10C, whereas all previously completed Electras have been of the 10A model powered with two Wasp Juniors. An improvement in the new Electra is the installation of a streamline type windshield which slopes backward, in place of an earlier type which sloped forward.

The new Electras will be placed in service between Los Angeles and Nogales on the north and Mexico City on the south, with Durango as the junction point of the routes south from Los Angeles and Nogales. On a trial flight, Vernon A. Dorrell, operations manager of Aerovias Centrales, cruised the Electra leisurely from Mexico City to Los Angeles in nine hours and five minutes. Single-engine Lockheed Orions were formerly used in this high-speed service.

Northwest Airlines, St. Paul, has taken delivery of its fourth Lockheed Electra, Wasp Junior powered, for its northern transcontinental service.

British Visitors

Henry B. Tate and wife, both licensed air pilots, and the latter a member of the British House of Parliament, are making a tour of inspection of American aviation. They arrived via American Airlines at the Grand Central Air Terminal in Glendale, where arrangements were made for them to visit the Vultee transport factory at the airport and the Lockheed plant in Burbank. Arrangements also were made for them to visit the Douglas factory in Santa Monica and the Northrop plant in Inglewood, the following day. "It will be a liberal education to see how the Electra, Douglas, Northrop and Orion transports are constructed," said Mr. Tate. "Their fame has reached Europe, and we are amazed with their accomplishments."

Mrs. Tate was particularly interested in the American Airlines' stewardesses and their training, and in the passenger comfort found in the Curtiss-Wright Condor Sleepers. Both were exceedingly enthusiastic over the beacons and other facilities for night flying.

3,500 Fly Sleeper Planes

More than 3,500 passengers have been flown at night in American Airlines' new sleeper planes, according to Charles A. Rheinstrom, general traffic manager of the company. Practically all have disrobed and used the berths assigned them. The new sleepers are in nightly service between Chicago and New York, and from Los Angeles to Fort Worth-Dallas on the Southern Transcontinental route from California to New York.

Courses in Navigation

SPECIAL courses in air navigation, to be given in one or two universities under Federal supervision, were recently asked of the Federal Aviation Commission by Comdr. P. V. H. Weems, U. S. N., retired.

Commander Weems, who taught Harold Gatty, Colonel Lindbergh and others much of what they know about navigation, thinks that such a course for civilian pilots is vital to the rapid advancement of transoceanic air services.

Ready for Winter

A steam heating plant, thermostatically controlled to maintain a constant temperature of 70 degrees in the passenger cabins of transcontinental airliners, is the latest achievement of aeronautical engineers, according to an announcement by T. W. A., Inc.

The steam heater, appearing for the first time on the T. W. A. Luxury Airliner, twin-engine Douglas plane operated on the sixteen-hour coast-to-coast service, is a miniature boiler in which water is heated by the engine exhaust. The thermostatic control, repeated tests have proved, maintains a constant temperature of 70 degrees in the fourteen-passenger cabin even though the outside temperature falls to 20 degrees below zero.

Besides the greater comfort of a constant cabin temperature, the steam heater eliminates any possibility of noxious exhaust gases entering the cabin. The perfect ventilating system of the plane changes the air in the cabin every two minutes.

With its steam heat, long cruising range and 200-mile-an-hour speed, the T. W. A. airliner is equipped to operate on winter schedules with the same regularity maintained in the summer months. Areas of inclement weather seldom extend so high the Airliner cannot fly over them and never are of such an extent to prevent the plane flying around them on an alternate course.

Arkansas' Seventh Tour

October 27th and 28th have been designated dates for the seventh annual tour of new airports in Arkansas. Approximately twenty-five airplanes have signed up for the aerocade, which will leave Little Rock early on the morning of the 27th for a visit to ten airports, seven of which are new fields recently constructed under CWA supervision; the other three fields have been materially enlarged and improved by the same organization.

The itinerary from Little Rock includes Ola, Russellville, Clarksville, Ozark, Fayetteville, Siloam Springs, Fort Smith; visits on the 28th will be to DeQueen, Texarkana, Arkadelphia and return to Little Rock.

The annual tour has been financed and regulated differently each year according to the number of airplanes available, the type of planes, and ownership. The 1934 tour might be considered as a sportsman pilot and private owner tour in view of the fact that each plane owner will bear his own cost of the voyage. Special rates have been secured for all expense items.

Included among the entries are three ships from the 154th Observation Squadron of the Arkansas National Guard. The Standard Oil Company, the Shell Petroleum Company and the Texas Company will also participate. The Commanding Officer of Barksdale Field, Shreveport, has been invited to send a three-ship delegation of pursuit planes. The Memphis Commercial Appeal is sending its Stinson, and Mr. C. R. SMITH, Vice President of American Airlines in Fort Worth, expects to fly one of his company's Stearman mail planes in the tour.

MR. W. R. DYESS, former State Administrator of the CWA and now State Administrator of the ERA, and his assistant, FLOYD SHARP, have been invited by the Tour Committee and are to make the trip as guests of the Tour, in view of the tremendous amount of airport construction work that their organization has done in Arkansas the past year.

The men in charge of the arrangements for the Tour are as follows: General Chairman, CHARLES M. TAYLOR, of Little Rock; Entries Committee, W. F. MOODY, of Little Rock, Chairman; FLOYD MUNCIE, Fort Smith; HOWARD WEBB, Texarkana; WALTER BEROSET and LIEUT. JOHN D. HOWE, of Little Rock. Itinerary—THOMAS E. FLAHERTY, Little Rock, Chairman; C. W. HOLDERBAUM, Little Rock; R. J. ROSS, Fort Smith; F. G. SMART, Pine Bluff; CAPTAIN ROBERT W. CHRISP and LIEUT. W. D. HOPSON, of Little Rock. Passenger—A. N. MCANINCH, Little Rock, Chairman; A. B. HARPER, JR., Fort Smith; JOHN W. CARTER, El Dorado, and OSCAR MCCASKILL, of Little Rock. Hotel and Banquet—LIEUT. ELLIS M. FAGAN, Little Rock. Gas and Oil, JOSEPH A. YOUNG, Little Rock.

Grand Central Plays International Role

Opening of the New National Theater of Mexico, located in Mexico City and aptly called the Palace of Fine Arts, developed quite a bit of business through Grand Central Air Terminal in Glendale. Various residents of California attended the premier, the majority using the facilities of the Central Airways of Mexico, which operates a ten-and-one-half-hour service between Grand Central and Mexico City. One group included Frances Drake, Catherine DeMille, Mary Boland and several of the motion picture executives.

Grand Central Air Terminal seemingly is becoming an important part of the motion picture industry, since there are companies making scenes almost daily. The latest was making a series of so-called process shots in which the Glendale runway was used for scenes supposedly taken in Europe. By means of trick photography, the Grand Central runway and the transports using it will be superimposed on the background of the Continental flying field, and it is hoped the public will not have good enough eyesight to read "American Airlines" when it flashes past and across the European background.

The T. W. A. Douglas transport, the American Airlines Curtiss-Wright "Condor" Sleeper, and the Vultee passenger and mail carrier—all of which are at the Grand Central Air Terminal in Glendale, every day are jointly responsible for bringing many distinguished visitors to the airport.

An interesting group was a delegation of illuminating engineers who came to personally inspect the newly completed S. & M. airplane landing lights, each one of which develops approximately 2,000,000 candlepower with only 35 amperes of 12-volt current.

The power of these lights is created with a scientifically former reflector of solid brass plated with silver. The lenses vary, according to the airplane in which it is installed and the desired spread of the beam.

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Editorials and Comments

(Continued from page 2)

status quo of a productive and reasonable price structure.

The transport companies have heretofore maintained passenger tariffs consistent with operation costs and on the basis of fair remuneration for honest services rendered. Cut-throat practices will inevitably lead to problems of more serious proportions should they be permitted to continue. At this stage of forming a rational Federal policy towards aeronautics, the slashing of passenger fares is like rocking the boat while shooting the rapids.

AT THE SCHOOLS

Gains Recorded at Parks

Student enrollment for the fall term beginning October 1 at Parks Air College, East St. Louis, Illinois, is nearly twice that of the same term of last year. Total enrollment this fall is 194, including 105 new students, as compared to a total of 107 students including 30 new men last fall.

Enrollment by courses this fall: Executive transport pilots, 22; aeronautical engineering, 44; master mechanic's flight, 62; master mechanic, 9; airplane and engine mechanics, 43; special mechanic, 1; aviation business, 3; transport pilot, 3; limited commercial pilot, 7.

A third dormitory building of brick and steel and to be air conditioned, is under construction. The structure will be one story high, accommodate 72 men and ready for occupancy January 1, 1935. The three dormitory buildings will provide residence facilities for 242 men on the school campus.

A Stinson Reliant four-place plane has been purchased and completely overhauled, and it will be used as a student training plane. New equipment in the primary motors department includes a Kinner 100 h. p., Wright J-5 220 h. p., and a Jacobs 225 h. p.

Spartan's Popular Course

With the confirmed belief that every mechanic should be able to fly an airplane, the Spartan School of Aeronautics at Tulsa, Oklahoma, releases figures to show that the most popular course at the school is the Master Mechanic Flight Course. Fully twenty-five per cent of the school's enrollment is for the course which is offered because of the constantly growing demand for mechanical students to learn to fly.

The length of time for completion of the course is five months, which includes the regular training as Master Mechanic and fifteen hours of flight instruction.

A course that is rapidly gaining in popularity and apt to out-rival the Master Mechanic course is the Special Transport course that equips the student to become a test pilot or flight instructor immediately after graduation. The course includes special ground school instruction. Eight months are required for completion, during which time the student receives 200 hours of flight instruction, 1,280 hours of ground school instruction together with the complete test pilot and flight instructor's course.

Enrollments at Spartan for the past month show the meteoric increase of eighty per cent. An all-time record enrollment is expected by the latter part of November. Fall cross-country fiights are being made with clock-like precision. Members of the Dawn Patrol recently flew to Paris, Texas, for the opening dedication of the new highway linking Oklahoma and Texas. Another flight is being planned for the early part of November, which will see a large portion of the Dawn Patrol flying to Gainesville, Texas, as guests of the Chamber of Commerce over the week-end. The famous formation, cross-country flights flown by Spartan students puts to practice the navigation learned in classrooms, training the pilots to fly over unfamiliar terrain and to land on strange airports.

Active Fall for Ryan

The increasing popularity of the Ryan School of Aeronautics at San Diego, Calif., particularly for fall and winter training, was shown by the arrival on October 1st of seven new students for flight and mechanical instruction. The list included Sanford Baldwin, Framingham, Mass., transport; Joe Duncan, Dixon, Calif., transport; Donald Patterson, Donora, Pa., limited commercial; and the following mechanics students: Joe Rheim, Butte, Mont.; Arne Hansen, Port Arthur, Texas; Carl Nesbitt and John Hoyt, San Diego.

The Ryan School of Aeronautics has been awarded the annual renewal of its Department of Commerce Approved rating for Transport, Limited Commercial, Private and Amateur pilots flight and ground courses. The Ryan School is one of the oldest commercial organizations of its kind in the United States and was one of the first schools to which the Department of Commerce awarded the full Transport approval — which rating it has consistently maintained without interruption.

Foreign Students at Curtiss-Wright

The Curtiss-Wright Technical Institute has attracted many foreign students in the past, but the present records prove more than ever before the international fame of the school at Glendale, California.

The nephew of the National Director of Aeronautics for Brazil is a student at the present time. This young man was given his choice of any aviation school in the world. There are several Chinese students, all graduates of colleges in China. One was sent to Curtiss-Wright by his government. On his return he will be an official part of the Chinese aviation industry.

Another young man is the son of the Director of Native Schools in Natal, South Africa, Natal being similar to one of our states. Still another is a Portuguese, a member of a family prominent in the colony residing in Honolulu. He is the son of a teacher who first investigated the relative merits of American aviation institutions.

Fifty New Students at Boeing

Fifty students started aeronautical training courses at the Boeing School of Aeronautics, Oakland, California, in October at the beginning of the fall term, according to General Manager T. Lee, Jr.

Some of the students have enrolled for the air line pilot course, which covers 250 hours of flight instruction coupled with nine months of intensive ground school work. Others are registered for mechanics courses of one and two years duration.

These students have come from twenty-one states of the Union and one foreign country to obtain their training at the Boeing School.

Specialized training, leading toward possible semi-technical and administrative positions, is the plan of the recently established Boeing Airline Operations course, a two-year curriculum now offered by the Boeing School.

Representing the most complete training in ground school offered by the aeronautical institution, the course prepares its graduates for employment in either the various departments of air lines or in aircraft factories.

Ports of Call

News From the Airports and Airways

Abilene, Texas

On October 2, INSTRUCTORS CAPTAIN MALLORY and CAPTAIN SWEELEY with sixteen student attack pilots from Kelly Field, San Antonio, visited Abilene en route to Fort Sill, Oklahoma.

DR. K. K. EASON of Rotan recently sold his Stinson in hangar at Abilene to MR. ELI MARLIN of Throckmorton.

Baltimore, Md.

The first "race to earth" ever beheld in this city featured the fall aviation meet under sponsorship of the Camber Club of Baltimore, a sportsman's pilot club organized three years ago to promote aviation from the standpoint of sport. Incidentally, the meet marked the third anniversary of the sponsors. The meet was scheduled for the first Sunday of October but was delayed until the second because of rain. The "race to earth" consisted of two parachute jumpers from Washington who "raced to earth" in a leap from an airplane 4,000 feet in the air. Each jumper delayed the opening of his parachute in the hope of beating the other to the earth.

This was but one of the many novelties featured in connection with this meet staged at the local Curtiss-Wright Airport, Smith and Greenspring Avenues.

Mass jumping was indulged in by five Washington aviation enthusiasts in a parachute jump. A spectacular jump also was made by Baltimore's premier jumpers, SERGT. WILLARD WARNER, and his wife, RUBY HARRELL WARNER.

Twenty-five airplanes from Baltimore, Washington, Philadelphia and Lancaster participated in the meet. There were a total of seven parachute jumps, races, stunts and military formation flying and maneuvers by army pursuit ships. Five planes of the Twenty-ninth Division, Aviation, Maryland National Guard, furnished dive-bombing and formation-flying exhibitions under the command of MAJ. CHARLES A. MASSON.

There were other thrilling events in an interesting program which thrilled the large crowd of aviation enthusiasts and spectators. Several thousand persons attended the event.

A suit for payment for airplane taxi, said to be the first of its type to be heard in the local courts, resulted in a $400 verdict being returned against the Acme Distilleries, Inc., of this city in favor of CHARLES F. THOMPSON, trading as the Thompson Flying Service. The case was tried before Judge Duke Bond in the Court of Common Pleas without a jury. The jurist also awarded the plaintiff $50 as counsel fee.

Papers in the case disclosed that representatives of the distilling organization had hired Thompson's plane for trips to New York and other places and had had him wait for them in New York. He charged $100 each for the New York trips and $10 a day waiting time. The suit claimed $900 was due the airplane service operator, but the lesser amount was awarded as all of the trips were not made on behalf of the distilling organization.

The Workers Aircraft & Manufacturing Corporation, plans production of airplanes and airplane parts or accessories in the building at Stemmers Run Road, near Mace Avenue. The concern, recently organized, is headed by JOSEPH A. CATOZZI. This project is proposed to be carried out by a number of former workers in airplane plants of this market.

DR. PAUL E. HEMKE, former professor or aeronautics and mathematics in the post graduate school of the United States Naval Academy at Annapolis, has been appointed professor and head of the department of aeronautical engineering at Rennsselaer Polytechnic Institute, Troy, N. Y. The wind tunnels at the Naval Academy were constructed by Dr. Hemke.

A large crowd of aviation enthusiasts attended the "all-woman air show" staged at the College Park Airport, College Park, Maryland. HELEN MCCLOSKEY, of Pittsburgh, won a close victory in the 25-mile handicap feature race. Miss McCloskey brought her plane in a bare 20 feet ahead of EDNA GARDNER, of Washington, D. C., in a finish which was cheered by the thrilled crowd of spectators. GENEVIEVE SAVAGE, of Washington, was third. The event was sponsored by the Washington, D. C., Women Pilot's Association, of which Genevieve Savage is president.

Beaumont, Texas

Robertson Airlines inaugurated their passenger run through here last September and have been doing well with passenger business on this Houston-Beaumont-Baton Rouge-New Orleans run. CHESTER EASLEY, the postmaster, was the first passenger from Beaumont.

NEIL PHELAN soloed the Cub Flying Service Taylor Cub after only two hours and twenty minutes dual instruction. Neil Phelan is president of the Beaumont Miniature Airways and his work with model airplanes seems to have been a help in flying a full-size one.

The Wing Over Club has inaugurated its fall series of spot landing contests and there has been much interest in them by the pilots. LUTHER CARUTHERS won the first place in the first two, and ANDY GIBSON, first, in the third contest. A cash prize is awarded at each contest and a "three-time" winner gets the trophy. The contests are held each Sunday at the muny port.

B. F. EDGAR'S "built in Beaumont" airplane was successfully flown for the first time in public on September 30. ANDY GIBSON was the test pilot for this model A Ford-powered ship, based on Pietenpohl's Air Camper design. DOROTHY MORROGH was the first passenger.

RALPH HALL and LUTHER CARUTHERS are continuing to do well with their barnstorming trips in Louisiana. They were booked for five days at the DeRidder fair and have "played" some Louisiana town every week-end. They always managed to get to the home port in time to enter the spot landing contest, however.

MISS LOIS NEEL, manager of the Cub Flying Service, has added another Cub to her school. Her original

Cub is a Continental-powered job and she is now operating an Aeromarine Cub which is owned by LOUIS DUHON, CLIFF HYLAND and LAWRENCE BARRETT.

INSPECTOR M. F. CLARK of the Bureau of Air Commerce paid his monthly visit to the airport and renewed several licenses of planes and pilots. Indications are that by his next trip he will have about eight tests to give for pilots' licenses.

Beaumont Municipal Airport visitors the past month have included H. G. BALLOVCA, in his Stinson en route to Atlanta; C. M. SCHOLES, Monocoupe, Galveston; H. C. BENDER, Monocoupe, Oklahoma City; L. G. TAYLOR, piloting M. B. MILLER's cabin Waco from New York; J. D. REED, Texas Fairchild Sales, came through driving a new Fairchild 22 to Houston from the factory and later returned with a 24 cabin job for demonstrations; MINSON FORD flew his Hisso-Travelair in from Nashville in a series of forced landings—but he made it. W. VERMILYA, in his new Stinson, made a charter trip here from Cincinnati; Waco cabin of ALFRED P. BURROUGHS, New Orleans to Brownsville, piloted by SNOWDEN NICHOLS; EDDIE ROSS, Tulsa, in the Beechcraft which he flies for Loffland Brothers Company; A. G. HENSHAW in the Shell Stinson, and a number of army jobs.

Chanute, Kansas

During the unfavorable weather conditions that existed through this section of the country Chanute Airport was the haven for several pilots. Among those were LOUIS W. COGHILL, of Lawrence, Kansas; Y. A. PITTS, of Fort Leavenworth, Kansas; V. D. STONE, of Fort Riley, Kansas; B. T. BARBER, of Colony, Kansas, and PILOT SEATON, flying for Braniff Airways.

B. T. BARBER has sold his OX Travelair to MERLE SMITH of Colony, Kansas. Mr. Barber is flying his OX Swallow T. P. now.

ALBERT PAYTON and IRA MOORE are getting in all kinds of flying experience lately. The pilots have added cross-countries and cloud or blind flying to their credit.

O. E. DICKERHOOF had a sudden trip to Ulysses, Kansas, the fifth of October. MRS. EVA SCRANTON, in the search for her lost baby, chartered Mr. Dickerhoof's J67 Monocoach for the trip.

IVAN SPONG purchased an Aeronca C2 from CLARENCE THROST of Concordia, Kansas. Mr. Spong is repairing the wings and recovering the fuselage. He expects to have the ship flying the first of November.

GEORGE BAGLEY is putting on the finishing touches to his Curtiss Robin and expects to have it flying the early part of November.

PAUL HIBBS repossessed his Kara Keen Coupe recently and has given it an overhaul and repaired a wing.

Coffeeville, Kan.

FRED GREIME, airport supervisor for the state of Kansas, on a recent visit informed us that our field was 95 per cent completed, which includes two hard-surfaced, all-weather, half-mile runways, one native stone hangar and administration building combined 80 x 100 feet, two floodlights, boundary lights, and a beacon and code flasher. The latter two now are installed on the water tower just south and east of the field, and are about fifty feet higher than they were formerly. Adjoining our field on the south is the new city park, which when completed, some time this fall, will give us a swimming pool and tennis courts within 150 yards of the hangar.

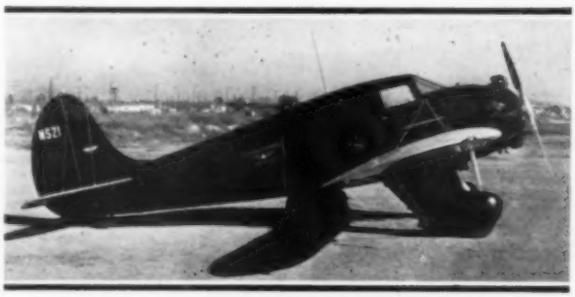
The annual air meet is being sponsored this year by the local Junior Chamber of Commerce. The date has tentatively been set for some time in November.

The Inman Brothers Flying Circus, which headquarters in Coffeyville, is in the western part of Kansas at present. DON INMAN, who flies the six-place Stinson, and brother ART, pilot of the Ford tri-motor, are reporting good passenger business.

About the sweetest airplane we have seen in these parts for some time was the Boeing F4B4. Four of these ships, property of the U. S. Navy, landed here recently en route from the East Coast to San Diego for repair.

AIRPORT MANAGER LYNN BERENTZ announced a few days ago a reduction in the price of instruction, and he has signed four new students already, one of whom is a girl.

El Paso Visitor



One of the new Kinner Playboys, recently delivered to the Bureau of Air Commerce for the use of aeronautical inspectors. Two others will be delivered shortly, according to L. Porter, Director of Sales for the Kinner Company. One of the Playboys will be stationed in the Southwest.

LOUISE THADEN visited El Paso October 12. She was flying one of the new Beechcrafts.

GRANT NICHOLS took his amateur license from INSPECTOR PETTIS, who gave all of us quite a surprise by flying into El Paso in one of the new low-wing Kinner Playboys which have just been purchased by the Department for inspectors. We understand that it is the first of its kind to be delivered. It has a 170-horsepower motor and a top speed of 150 m. p. h.

ARTHUR JOHNSON, Airport Manager, has just completed all work on the new 150 square feet of concrete apron in front of the hangar.

JACK WEILER and FRANK BOWMAN flew over to the Fair at Marfa recently and on the return reported large crowds and good returns from passenger hopping.

Fort Worth, Texas

American Airlines' Passenger Grill at the American Terminal has proved to be one of the most unique experiences for air travelers passing through Fort Worth. The comely stewardesses aboard the transports place an attractive menu card before the passenger just before the plane arrives. The order is radioed to the chefs at the terminal grill and when the passengers arrive, a tasty hot meal awaits them in the altogether attractive grill.

One of the new Douglas Luxury Airliners visited Fort Worth early in October en route to TONY FOKKER in Holland It is to be placed in service of the Dutch K. L. M. Line. CARL COVER, Vice President of the

Douglas Aircraft Company, was flying the new airliner with five passengers aboard. One was a representative of the Aluminum Company of America and the other four were Austrians en route to their native land.

GLEN HARROUN, flying executive of the Sinclair Oil Company recently flew his Lockheed to Corpus Christi to combine business with lots of good tarpon fishing.

BUSTER TRIMBLE has successfully test-hopped his J-5 Travelair, which has just been completely overhauled and rebuilt by Trimble et al. He is justly pleased with its performance.

RAY THOMAS, who began flying August 13 and received his Amateur License October 2, now flies to work in an Aeronca. He is superintendent of the Fort Worth Sand & Gravel Company's productive pits just east of the city. To celebrate the license, Thomas and HARRY DODSON flew to Waco for lunch.

EMILY FRAZIER manages to drop in from Tyler several times each month to keep up her flying time.

C. C. KERSEY's home-made job is again flying nicely after replacing the OX 4 with an Anzani. The ship has been named "The Kern."

TOM ELLIS is back at Meacham Field after a trip to Rodeo, New Mexico.

ED RITCHEY will soon offer an open and cabin plane for blind flight training. Both ships will have complete dual set of instruments which will include the sensitive altimeter.

LEONARD SIMON, Traffic Manager for Bowen Air Lines, and BILL MOORE, pilot, were flying a privately owned Stearman to Brownsville recently when they spotted a buck on the lower reaches of the King Ranch. Diving at the buck for a closer inspection of the deer situation, the infuriated buck lowered his head for battle and literally chased them off the wilds of his domain.

Joplin, Carthage, Mo., Activity

H. G. HARPER, who operates the Carthage Airport, has taken over the management of the Joplin port also, putting LOUIS PROCTOR over there to manage it. Harper moved his Ryan over there to make more room at Carthage. He has just finished overhauling the Szekely that sits on top of his Curtiss Junior. He has a number of students learning in the Junior both in Carthage and Joplin. On certain days he flits over to Joplin, a distance of about nine miles, and gives dual instructions here. He is lining up some students for a mechanic's course. RIP MCMURTRY, of the Joplin Globe, has discovered that the Junior is a swell crate to photograph from and takes aerial views of the surrounding country.

Harper repowered his OX Travelair this summer with a Wright J-5, building the mount himself, and added brakes to some new wheels he put on, and reports that it is really a sweet flying ship. He is now overhauling a J-5 for O. K. SOUTHWICK at Springfield, Missouri. The Carthage port has three new runways 100 feet wide and 3,000 feet long surfaced with mining chat, making the 160-acre port visible for a fifteen-mile radius.

At Joplin BYRON MCCARTNEY went to work and jerked a troublesome OXX-6 from his Waco and installed the OX-5 taken from Harper's Travelair and is very much pleased with the job.

The Johns boys, HOMER *and* BILL, are doing a nice passenger business off the Joplin port in their Travelair.

Lubbock, Texas

The Lubbock Municipal Airport has had over one hundred visiting planes during the last thirty days, which included quite a number of all types of military aircraft from fast little pursuits to large bombers.

Many rush calls have been the object of much activity of late. MR. ROY BEASLEY was rushed in from Hobbs, New Mexico, via airplane for an emergency operation. MR. CLIFF LINDSEY, president of Lindsey Theatres, Inc., was rushed out via airplane for treatment in Del Rio. MR. CHARLES GUY, local editor, made a rush call to Tulsa, Oklahoma, to the bedside of his father. One of our local pilots, MR. E. E. HENDRICKS, is quite ill at this time in the Veterans' Hospital, Albuquerque, New Mexico.

Someone advise us how to get all the inland towns marked for air navigation. Most of the larger towns and cities could easily be made more discernable by more air-marking, and although some progress has been made with CWA funds of late in many sections, more air-marking of towns is necessary.

Los Angeles

T. Claude Ryan and Earl D. Prudden, president and vice-president, respectively, of the Ryan Aeronautical Company at San Diego, California, flew the company's new Ryan S-T low-wing monoplane to Major Moseley's stag barbecue at Glendale recently and literally "stole the show" with the plane's trim lines and exceptional performance. The Ryan Company claims this new super sportsman metal fuselage job is the fastest standard-built plane on the market for comparable horsepower and demonstrations left no doubt as to the validity of the claim in the minds of observers.

Marshall, Missouri

EARL SMITH was in Marshall several weeks giving his Barling a complete going-over and refinishing. He left here to go to Tennessee, where he expects to work the fairs and other large gatherings of people in that section, hopping passengers on his way south, where he expects to spend the winter.

WILLIAM POWELL bought a small two-place tapered-wing biplane at Wabeleau, Missouri. BILL and SHORT expect to go in together on it as soon as they get it home. Short has a radial air-cooled motor which they are going to use.

OLE FAHLIN and DR. LAWRENCE of Marshall made a trip to Minnesota in the OX Robin. They encountered some bad weather and low ceilings on the return trip.

LAWRENCE SHORT is taking his A and E examination on the 27th of October.

Memphis, Tennessee

Overnight sleeper service between Memphis, Washington, Philadelphia and New York via American Airlines and effective within sixty days was announced by EDWARD L. HURLBURT, city traffic manager of the airlines.

The announcement followed that made by LESTER

D. SEYMOUR, president, that American Airlines' $2,500,000 re-equipment program had neared completion with the purchase of ten improved Douglas transport planes.

Under the new schedule, Mr. Hurlburt said, the Memphis business man could work a full day here, eat dinner with his family and board the eastbound plane at 11:10 o'clock that night, arriving in Washington about 5:50 in the morning, Philadelphia at 6:40, and New York at 7:30 a. m.

No change is contemplated in the recently reinstituted night mail schedule. The mail plane will be replaced by the giant Condor "sleepers" and carry the mail as well as passengers.

The new Douglases will replace the Condors on the day runs, while the Fords and Model U Stinsons will be retired from service.

Mobile, Ala.

Mobile has developed its municipal airport, Bates Field, to keep alertly apace with the growth of aviation. A former modest project today represents a virtually completed modern plant. Major improvements, now largely finished, have been carried out in co-operation between the City Government and Federal Relief work agencies. Service, efficiency and accommodation have been greatly increased by new structural and field facilities.

Later on, when all the finishing touches are done, a dedication program is contemplated to demonstrate and emphasize the job achieved in modernizing the airport. It is expected that these ceremonies probably will be arranged jointly by the city authorities, the Aviation Committee of the Junior Chamber of Commerce and the Aviation Committee of the Senior Chamber of Commerce, with MR. WYTHE WHITING, Chairman, and MR. ROBERT L. MARSHALL, Chairman, respectively, of the above Aviation Committees.

The airport property consists of 195 acres, which is virtually cleared of all landing barriers on all sides. The present holders of the air mail contract over the New York-Atlanta-Mobile and New Orleans route is the Eastern Air Lines, Inc., and it is expected that that agency will soon launch an express passenger service over this route, with the bulk of the flying to be done at night.

Recently blue-eyed little SALLY ANN DAVENPORT, who was born May 24, 1934, made a long airplane trip. With her parents, MR. and MRS. C. D. DAVENPORT, St. Charles Apartments, Sally Ann left Mobile on an Eastern Air Lines plane northbound for Charlotte, N. C. The 800-mile trip for the little miss ended at the Charlotte airport, where she was greeted by relatives of Mr. and Mrs. Davenport, who formerly lived in Charlotte. Sally Ann at the time of her trip was only twelve weeks old and weighed eleven pounds. Because of her extreme youth, she was permitted to ride free, and air line officials in Mobile say they do not remember a younger passenger. Sally Ann's parents are prominently identified in the life of Mobile, Mr. Davenport being Assistant General Manager of the Chamber of Commerce.

Oklahoma City. Okla.

Saturday, October 20, eighteen planes left Oklahoma City for a second tour covering C. W. A. airports recently completed in southeastern Oklahoma. Wilburton, Heavner, Ft. Smith and Muskogee were visited. A night stop at Poteau was the scene of the unusual hilarity attendant to such events. MOSS PATTERSON was manager, CLINT JOHNSON, referee, and JAMES BRAZELL, starter. ROY HUNT wrote "Marland for Governor" at each stop and he and CLYDE WHITTENBACK of Tulsa provided the stunts at each stop. Sunday, enough planes joined to make the total forty-one ships.

ROY HUNT has returned from an extended tour of the East and expects soon to close with National Advertizer for a smoke writing contract.

RUSTY BONDS, formerly with Continental Oil Company, is now Aviation Head of the Black Gold Refining Company of Oklahoma City.

Production of the Straughan Biplane powered with a converted Ford V motor has been started in Oklahoma City. The south hangar on the Muny Field now is used as their factory.

MERRELL MORGAN has been busy with cross-country trips to Old Mexico. Hunting parties are paying the bills.

CLYDE NUCKOLS is the proud owner of a new Cabin Fairchild. UNCLE JIM BRAZELL says he can solo it cause it's got a stick; after all, Uncle Jim handled billyclubs before there were airplanes.

REINAUR BROTHERS, of the Reinaur Brother Motor Company, Oke City,—Fred, Joe and John, all flyers—have just taken delivery on a new Cabin Fairchild. Fred and Joe ferried it from the factory.

St. Louis, Mo.

Owners of private planes in and near St. Louis, Missouri, were the guests of the Union Electric Land Development Co., at Bagnall Dam, Missouri, in the Ozark Mountains. The visitors stayed at the Casino, a clubhouse owned by the company, and inspected the scenic spots of the Ozarks. Twenty-one planes were flown to the dam.

EARL RICK, of Hot Springs, Arkansas, has purchased a Fairchild Cabin from the St. Louis Flying Service, St. Louis, local distributor.

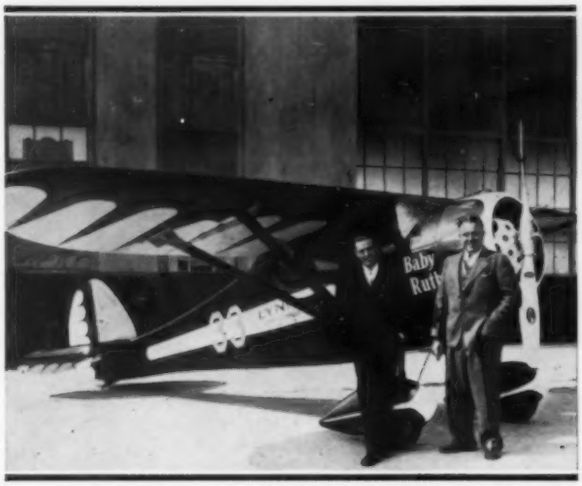
Four hundred selected Boy Scouts of St. Louis were taken in groups of seventy-five to the aircraft factories, airline division headquarters and the army and naval service hangars at Lambert-St. Louis Municipal Airport. The equipment was demonstrated to the boys by the officials.

Lambert Aircraft Corporation of Robertson, Missouri, near St. Louis, has exported two DeLuxe Model 90 Monocoupes to Seville, Spain. The orders were placed by M. ARTEMAN, the company's representative. The two planes were crated in the same box and will be assembled in Seville.

WILLIAM LARNER, formerly at Oklahoma City and relief field manager in the eastern region, has been appointed T. W. A. field manager at Lambert-St. Louis Municipal Airport.

The organization of an interstate flying unit of Missouri and Oklahoma has been proposed by GOVERNOR WILLIAM MURRAY. COL. F. T. KREPLOW and LIEUT. COL. OTIS SMITH of the Oklahoma National Guard were in St. Louis recently to confer with COL. HAROLD J. CONRAD on the proposal.

Handicap Entry



One of the smallest American-built planes to be entered in the gruelling 12,000-mile race from London to Melbourne last month and the plane that captured the especial interest of His Royal Highness, the Prince of Wales, at the take-off on Mildenhall Airport was the Warner-powered Monocoupe D-145 "Baby Ruth," piloted by Captain Jack Wright and John Polando. The tiny racing plane is a specially designed clipped-wing Monocoupe capable of top speeds of nearly 190 miles per hour, burning approximately eight and one-half gallons of gasoline at cruising. It was entered in the handicap event of the race.

The plane carries with it many speed achievements with Wright at the controls. Polando, who will be remembered for his role in the record long-distance flight from New York to Istanbul, Turkey, was navigator in the flight and relieved Wright periodically along the route.

The necessary facilities for overnight air mail service from St. Louis to the South and Southwest will be installed and ready for use about Jan. 1, according to the air board of the St. Louis Chamber of Commerce.

Installation of the lighting equipment on the St. Louis-Tulsa-Dallas and the St. Louis-New Orleans air mail routes will be completed about the first of the year, it was announced. RAYMOND A. WALSH, the chamber's representative in Washington, stated in a communication to the chamber the final beacon sites on the St. Louis-Tulsa route have been obtained, and SUPERINTENDENT OF CONSTRUCTION MCDONNELL, now at Springfield, Missouri, "will proceed vigorously, hoping to complete the lighting about Jan. 1."

"Lighting of the New Orleans-Jackson section of the St. Louis-New Orleans route is two-thirds completed," Walsh stated. "The Jackson-Memphis section is about one-half completed. Lighting of the Memphis-St. Louis section is just getting under way, but is expected to be completed Jan. 1."

E. Y. MITCHELL, Assistant Secretary of Commerce, advised the chamber several months ago the Post Office Department had given assurances overnight mail service would be established as soon as lights were installed.

An amphibian ship carried Toto Tembo, 20-week-old African elephant and 268 pounds in weight, from New York to St. Louis, and pulled up alongside a derrick which was used to hoist the baby elephant to the ground at the Lambert-St. Louis Municipal Airport.

Swooping down over a large elephant herd in their two-motored ship, MR. and MRS. MARTIN JOHNSON, famous team of explorers and big game photographers, stampeded the pachyderms in Africa and little Toto was left deserted. A hasty landing, a capture and a quick take-off from the veldt and Toto was a prisoner. The elephant, 38 inches high, is now in the bird house of the St. Louis Zoo.

Topeka, Kan.

W. G. WOOD, manager of the Topeka Flying Service and representative of the Aeronautical Corporation of America, Aeronca airplanes, reports the sale of a used C-3 Collegian two-place Aeronca to KENNETH W. HOLMES, Kearney, Nebraska. He also reports the sale of a new 1934 model Aeronca, with brakes and heater, to DALE FARRAR, Burlingame, Kansas, and is leaving the last of the week to fly the new ship back for Mr. Farrar from Cincinnati, Ohio.

At the present time the students enrolled at the Topeka Flying Service have reached the grand total of forty-eight. There has been a lot of activity at the airport this fall and the prospects of new students seems very good.

CAPTAIN WATSON, stationed at Fort Leavenworth, Kansas, set it here in a Boeing P-12 too nearly out of gas and too dark to reach his destination, his ship being without lights. This gave us all an opportunity to inspect the P-12 and it is really one airplane. The commander of the post at Leavenworth came after Captain Watson about 9:00 that night, and in attempting to locate the Topeka airport dropped three flares, The first one being about seven miles from the airport. This caused quite a lot of comment, telephone calls and automobile trips as this was the first aerial display of fireworks for Topeka and vicinity, and a great number of people collected thinking it was another Chicago fire. This is just one more reason why Topeka should have a completely lighted airport, and with the advent of our new city administration we are in hopes of getting them.

After about eight months of intensive CWA and FERA labor, we may have an administration building to move into by November 1st. We are also hoping that we may have a hangar, new and modern (not so much new—but modern), the facilities of which will more or less coincide with the yearly fee we pay for modern operating facilities which we are not now receiving.

FRED GRIEME, former Department of Commerce Inspector, has just purchased a good looking Stinson SM-8A. Fred is headquartering out of Topeka and will be in here quite a bit of the time. This ship will be a credit to our new airport.

BILL ONG, Waco representative, gave us a visit and demonstrated to us all the advantages of the new Waco Cabin. We must say we were all favorably impressed and Bill really knows how to demonstrate the ship.

CURLY EDMONSON, former Washburn College football star, now a flying cadet at Kelly Field, called on us and demonstrated to the boys the art of army training. He really made that Aeronca moan like a P-12.

Waco, Texas

Sunday passenger hops have increased in volume at Waco the past month due to the pleasant fall weather.

WELDON TADLOCK has sold his OX Eaglerock to FRANK FALLIS, of Clifton. Fallis intends to use his ship

for pleasure trips as soon as he is capable of handling it.

BEN HUTCHERSON and RALPH COSTON, of Clifton, have been keeping the air churned up over Rich Field recently in their OX Travelair that they purchased from R. M. "BROWNIE" BROWNING. Ben has designs on an L. C. in the near future, while Ralph, though not so far advanced, has similar plans.

L. E. "DAN" DUNEVANT, erstwhile pusher pilot and graduate of DICK YOUNG'S flying school, has purchased JACK WEBSTER'S OX Robin. He intends to recover and license the ship and build up that time so valuable to seekers of the D. of C. Licenses.

W. D. "DEES" or "MAC" MCDERMOTT has made several trips this month in his trim Stinson. Some of his stops have included San Antonio, Houston and Dallas.

JOHN BARNES has aired out his Stinson fairly well, having made recent trips to his ranch in the Mason County country, Austin, Houston, and New Orleans.

BILL GRAY, local sportsman, has taken time from his dove shooting to take a few Sunday hops to nearby points.

A group of twelve Boeing P-12-E Pursuits dropped in on Rich Field the other morning from Barksdale Field, Shreveport. They were working out a war problem concerning interception of attacking ships. Some wag remarked after their take-off that the local ships wouldn't dare take to the air that day because of the stirring the Pursuits gave it.

R. L. BOWEN, of Fort Worth, has been a frequent visitor in his new Stinson.

DICK YOUNG and the Pusher are still grinding out embryo birdmen. The young Wasp (Szekely) has become a favorite fixture in Waco and is slowly gaining in recognition. It has ceased being a Seventh Wonder and has taken an important place in the eyes of the amateurs as the first real step toward a cherished goal.

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A Roving Reporter Visits Eastern Texas and Southern Louisiana

Palestine

The snowy white airport circle and the lettering "Palestine" were a welcome sight to the roving reporter as we circled the field for a landing in the Fairchild 24, a demonstrator ship of the Texas Fairchild Sales Corporation, of Houston. We taxied across the well-cut grassy field for a brief visit at this thriving airport, which is under management of C. W. Blackwell.

Helen R. Johnson, one of the few women transport pilots in the state, has been very active in making Palestine an air-minded city and the results show in a hangar full of ships and a good student list. Dr. A. A. Speegle keeps his Lycoming-Stinson there, Lacey Adams has a Warner-Fleet, M. M. Rogers stores his J5-Travelair, and Gulf States Chemical Company have put their two Challenger-Commandaire dusters in storage for the winter at this port. Helen Johnson's Stinson and Blackwell's Fleet are also found in the 100 x 120-foot hangar.

The new 50 x 50-foot repair hangar and shop has been the scene of quite a bit of work lately. C. W. Blackwell has converted a 2000 Travelair to a 4000, refinished a J6-5 Spartan for Art Sly of Gladewater, tuned up an OX-6 Travelair, which was sold to a pilot at Mexia, and rebuilt an OX-5 Travelair, now owned by B. A. Black, of Bryan, Texas. C. W. is quite proud of his fine shop with its splendid equipment and a heated dope room.

Dr. A. A. Speegle put his Stinson through some active service recently on a vacation trip to the Cleveland Air Races. En route, his son, Arthur, Junior, got married at Nashville, so it turned out to be a honeymoon ship. The doctor was granted his private license at the Palestine field by Inspector R. W. Delaney, as were Charles D. Blackwell, 17 years of age, by the way, and M. M. Rogers.

Among students at the airport now are: Lorraine Burns, Roy Wallace, Charles Speegle, Cull Richards and Johnny Ross.

Center

Then off to Center and its new CWA airport. It is a fine field, especially for a town of its size, and J. B. Sanders, along with Brad Collier, and several other air-minded citizens are to be highly congratulated for their successful efforts to secure $12,000 for this project. Located about a mile from town, the field is well marked and has a 2,700-foot north-south runway and a 2,400-foot east-west runway. There is a small hangar on the field with living quarters and a club room, windsock, gas, telephone and transportation to town. The hospitality of Center to visiting pilots is becoming famous, incidentally.

Repairs can be made by the States Aircraft Corporation, whose factory at Center is also an approved repair station, one of the few in Texas. Formal dedication of the airport was held on May 20, 1934, and the field is a welcome sky harbor in that East Texas sea of trees.

Plans are now underway for the development of a flying school there. Dr. L. S. Oates has been appointed medical examiner for the Department of Commerce, and L. A. Downes, at present test pilot for States Aircraft, will be chief instructor.

The States Aircraft Corporation has been busy on rebuild work, in addition to building the States monoplane. Joe Isvolt is in charge of construction. Leo Childs and Orville Metcalf are also connected with the built-in-Texas States factory.

Orange

While flying about, we dropped in Stark's Field at Orange and discovered that Jack Leon Echols has developed a highly successful flying school there. Jack uses Taylor Cubs for instruction and has a notable list of students in southwestern Louisiana. In Orange, Echols' student roster includes: Victor Landrum, Harold Sanders, Orvell Bunch, Lawrence E. Barrett and Cliff Hyland, all of whom have soloed. Other Orange students about to sprout wings are: Arthur Colburn, L. N. Freey, Roy Trahan, G. N. Gilcrease, Louis Duhon, Hoy Duhon, Franklyn Noguess, Curtiss Beatty, Bill McDonald and Miss Lynne Carter.

Welch

Jennings, La., students who come over to Welch, La., for instruction (Echols visits the Welch airport twice weekly) are: Carl Barnette, Howard Blessington, Richard Tonn, Everett Stackhouse, Roy McKeague, Walter Broussard, "Dutch" Huber, Clint Carey and Mrs. Alva Haywood. Alva Haywood already holds a transport license and his wife is going to catch up.

Welch students include: James L. Derouen, Elmer Harris, Emerson Walker, Edgar Kimball, Willis

Houck, R. E. Estess, Asa Benoit, P. W. Young, Mrs. Elmer Harris, Lenora Armstrong, and the mayor's flying family, James, Rita, Edwin and R. W. (Junior) Howard, and daughter-in-law, Ruby Howard. This should be a flying family record of some sort.

Echols also gives instruction at Sulphur, La., to Leon L. Currie (who was the first student soloed in the entire class), Dr. R. B. Marshall, Harvey Reimer, Cooper Patterson, Wilbur Patterson, J. C. Cooper, Leonard Guilroy, and Louis A. Clemmons.

Echols, an instructor of many years' experience, is to be congratulated on his large brood of student pilots.

New Orleans

Again in the air, the roving reporter dropped in at the Wedell-Williams airport in New Orleans. R. Braud, genial manager of the port, gave us the dope on operations.. Wedell-Williams Air Service operates Lockheeds for charter trips with Walter Wedell, J. A. Worthan and Doug Worthan as pilots. Pacific Seaboard Company (Chicago-St. Louis-New Orleans) base at this field with Charlie Payton in charge of operations. Ben Catlin is chief pilot of Pacific and Bill Frey and Joe Taft complete the pilot's list. Robertson Airlines (Houston-Beaumont-Baton Rouge-New Orleans) terminate at Wedell-Williams field and Robt. Sands is their general traffic manager. Joe Read is chief pilot and Charles Kratovil and Milton Sater are his assistants.

Braud reports that there has been much aerial advertising, photography, cross-country and student work from his port in the last two months. Among the local flying services participating in these activities are: Thos. Fortson, Inc., who do aerial surveys and photos with their Fairchild cabin, and the Lucas Flying Service, Ray Lucas, manager, which has a Waco F and Lincoln Page Trainer available for student instruction. Increased student interest lately has kept Instructors Sidney Mevers and Doug Langstaff busy.

The newly appointed State Aeronautical Inspector, D. O. Langstaff, bases at Wedell-Williams with his American Eagle. He is scheduled to get a new ship soon. The Bureau of Air Commerce Inspector, McWilliams, divides storage time on his Fairchild cabin between Shushan and the Wedell port.

Private owners hangared at Wedell include Miss Edith Fasterling, Louisiana's only woman pilot, with her Kinner Bird, and B. A. Parker with his Lincoln Page.

Students include Herbert Callahan, Parker Aeiry, George Warner, Murlyn Nunnery and C. Lawson.

Time permitted only a brief visit to Shushan airport and the roving reporter hopes to return there soon for a longer visit. We rambled about with E. E. Elam, the general manager, for a hour or so, but didn't get to see everything—the ultra-modern gadgets intrigued us so much that we couldn't get settled down to the business of collecting dope on activities.

Not too Technical

(Continued from page 17)

design of the engine. In this case it is evident that the pitch of the blade can be carried much closer in toward the hub than in the case of the motor with the large frontal area, resulting in a more effective propeller action.

Determining the Pitch

Figures 3 and 4 illustrate the various angles of pitch at various stations along the propeller blade from the tip to the hub. Also by means of these figures, we have a simplified method of determining the pitch of the propeller at any point on the blade. For illustrative purposes, let us consider the length of the propeller to be seven feet. It follows that the circle described by the tip in one complete revolution would be 7 x 3.1416. We must bear in mind that as the propeller turns in a circular course it also moves forward over the distance BE, which we will arbitrarily set as five feet. Consequently the actual distance traveled by the tip of the propeller would be a course from A to B or 22.56 feet.

To determine the angle of pitch at any point along the blade, it is necessary as illustrated in Figure 4 by points C and D to calculate the circular distance traveled by that particular point as the propeller turns. For example, Point C in Figure 3 is a station half way between the hub center and the tip of the blade, or 1.75 feet. A circle described by this particular point would have a circumference of 11.99 feet. From this point on line AE, a line must be drawn to point B. The angle BCE is therefore the angle of pitch of the propeller at the half-way station. Likewise we can determine the pitch of the propeller blade at any point even up to the hub, where it is evident, if lines were dropped from point B, the pitch of the propeller would be parallel to the axis of rotation.

Kinner Sales

Mr. N. A. O'Mara of Sells, Arizona, has just made a complete flight around the United States in his Kinner Sportwing. Mr. O'Mara purchased a Kinner Sportster in June, in which he learned to fly. He subsequently turned the ship in on his Sportwing, both airplanes being purchased through the Kinner Airplane & Motor Corporation's dealer at San Diego, W. A. Speer.

The Williamsburg Flying Service at Williamsburg, Kentucky, has recently purchased a Kinner Sportster.

Air Mail for Economy

During the first week that T. W. A. was authorized to carry mail on the "Sky Chief," which departs every afternoon from Grand Central Air Terminal in Glendale, the volume of mail brought to the airport by individuals increased more than ten-fold.

Up-to-the-second business men were quick to realize that mail with nothing but conventional air mail postage would be in the first regular delivery the next morning in Chicago and in the noon delivery in New York.

Concensus of opinion among the representatives of various firms who are making it a daily practice to get their mail on the "Sky Chief" is to the effect that the overnight air mail schedule across the continent has cut telegraphic bills in half.

On The Record

(Continued from page 11)

of no other business which has such restrictions on raising new capital," he said. "I know that in our own case, until a large interest in our parent company was secured by one of the large industrial groups in this country, it was difficult for the management and employees of the transport subsidiaries to know from day to day for whom they were working. This far-seeing group have already contributed and are continuing to contribute management and research services to our companies which we could never hope to obtain if we had to pay for them."

Similarly, Mr. Seymour sees the eventual separation of companies from working capital reserves through the corporate changes necessitated by the new law. Mr. Patterson, quoting figures, said that "United Aircraft and Transport Corporation was forced to expend approximately $615,000 to properly reorganize as required by law. This dissolution and divorcement of requirement companies from holding companies is in no way whatsoever a technical dissolution. It is a complete divorcement. In my opinion the co-ordination of aeronautical research and development work will suffer."

Present Restrictions

Existing restrictions as to the grouping of air mail routes are, in the opinion of Mr. Breech, definitely uneconomic. "There is," he said, "limitation as to the number of routes which a single company may operate. I am definitely in favor of maintaining competition in the air transport industry. I feel that I only need to point to the improved equipment resulting from the competition of existing groups of air mail operators." Also the reduction of length of time required to span the continent was pointed out.

In regard to the stipulation that no company hold more than three air mail contracts and that no operator can hold two primary route contracts, Mr. Patterson asked the pointed question, "Why is it legal for a railroad and illegal for an air line to operate both transcontinentally and on a seaboard route? The trend in railroad legislation, with the approval of the Interstate Commerce Commission, is toward strong, well-financed railroads, and towards consolidation, not the breaking up of transportation into more and smaller units."

To break up the larger systems into a number of smaller lines is impractical and uneconomical in the opinion of Mr. Seymour. "To compel them (the transport companies) to separate into smaller units is not only to undo the work of the past and go backward, but to entirely disregard the lessons from experience," he said. "Only a few of the carriers in the country have pay scales in accordance with the decision of the National Labor Board although those that do pay it are faced with competitive services with much lower pay scales. Vastly inferior equipment, etc., add to the chaos and unfairness of the situation."

Conclusions

"Stabilize the industry and new capital will be attracted," are the words of Mr. Monro. "Stabilize the industry and public confidence will assert itself in rapidly increasing patronage. Stabilize the industry, with a guiding hand to prevent over-enthusiasm and unjustified expansion, and normal expansion will provide increased employment. If that is done, the governmental assistance required by air transportation can be steadily reduced to the inevitable point when the entire industry will become self-sustaining."

It appears to Mr. Seymour "That the first and most important problem that must be answered if America is to continue her air transport leadership, must be the formulation of a plan that will permit air transport companies to operate at a reasonable profit and with assurance of future security, contingent, of course, on doing their job properly. This involves financial self-support; protection of routes against cut-throat, unnecessary or unfair and irresponsible competition, and the opportunity and inducement to develop aircraft and services capable of greater usefulness to the public and to the nation. It is impossible to expect that this can be brought about under the present circumstances or anything approaching them. An inspection of the books of the companies, and the earning ability of the airplanes themselves, will serve to indicate this point conclusively."

In the conclusion of the statement of Mr. Breech he opined: "Even admitting that any type of organization is subject to abuses, if it is seen fit to have a permanent Federal Aviation Commission to exercise regulatory powers over this industry, such abuses could be corrected by the Commission itself, with more flexibility as to judgment than under rigid and questionable laws."

Throughout the testimony of the executives of our great air transport systems during October, one is impressed with the frankness, the constructive attitude and the industry's confidence in the Federal Aviation Commission to bring the industry out of chaos with recommendations to Congress for rational legislation to the end that a continued healthy growth and development of air transportation in the United States will finally result from Federal policy.

All who have appeared before the honorable body during the public hearings realize the tremendous proportions of the task before them—the task of recommending legislation regarding all phases of aviation. It is felt that the phase of scheduled air transport will be adequately regulated and stabilized by the Commission in the light of the testimony brought forth by the executives and pioneers of American aviation.

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De-icers Installed

In preparation for the forthcoming winter season, installation of special United-Goodrich de-icing equipment is now being made on transports of United Air Lines. Devices of the type co-developed by United Air Lines and the Goodrich Rubber Company are expected to improve performance records of the company. The de-icers are said to be considerably lighter and more effective than previous types of ice-removing equipment. This represents the first use of de-icers by an air line as standard equipment on a large scale.

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at the right time is a helpful stimulant if the proper drug is used. Business, too, often needs a "shot in the arm" to give new life to a slow, dragging trade. You will find a classified or directory ad placed in Southwestern Aviation to be a timely stimulant to increase your sales or to help you find something you want to buy.

FOR SALE OR TRADE—All metal hangar located at Corsicana, Texas, 60 feet deep, with 80-foot doors. Will consider light plane as partial payment. Charles Pedley, Route 1, Irving, Texas.

Kelly Cadets Get Wings

A total of seventy-six students were graduated from the Air Corps Advanced Flying School at Kelly Field, Texas, during the October ceremonies. The personnel included one officer of the Air Corps, regular army, forty-three second lieutenants of the regular army, who graduated from the United States Military Academy in June, 1933, thirty civilian and enlisted students and two students from the Republic of Mexico.

The usual aerial review with graduates as participants took place prior to the commencement exercises which were held in the War Department Theater.

When the class started training at the Primary Flying School, Randolph Field, in October of last year, there were 169 students of whom 92 were West Point graduates. Therefore 45 per cent of the class successfully completed the twelve months' courses. Air Corps statistics show that the number of students successfully completing the full course varies from 44 to 50 per cent.

With twelve students, Texas leads the field in number of representatives. Houston, Texas, leads the cities represented with five graduates, and Los Angeles, California, following with three.

Improvements at Little Rock

Immediate construction of a modern hangar and administration building at the Little Rock,Arkansas, Municipal Airport is assured with the recent decision handed down by the Arkansas Supreme Court, to the effect that the city of Little Rock can legally pledge revenues from the airport toward repayment of a loan from the Public Works Administration. The ruling was handed down in the suit of T. J. Parker vs. City of Little Rock, which was instituted in the Pulaski Chancery Court at the request of PWA officials. The suit was filed last spring but a decision could not be reached before the summer adjournment of the Supreme Court and it was passed until the court reconvened.

A total of $69,500 asked by the city for construction of the hangar and administration building was set aside early this year by Washington PWA officials, pending outcome of the suit. The application for the loan has been formally approved but PWA officials insisted that a test suit be instituted to remove all legal obstacles.

Although 15 days must elapse before the decision of the high court can be certified by PWA officials, the final contract probably will be signed as soon as the certification is completed and bids advertised immediately. Work on the project probably will be under way within two months, and will require about 90 days for completion.

Gyroscope

(Continued from page 6)

ceived when outside visual reference is available. In other words, the attitude of the airplane relative to positions of bank or pitch is instantly available at a glance. Looking at the instrument as it is mounted in the cockpit we see a circular face about four inches in diameter consisting of a background which is blue on the upper half to represent the ground. Horizontally across the center of the background is a white bar representing the horizon and immediately back of the glass covering the face and in the center of the face is a small tail view silhouette of an airplane. When the airplane noses down, the horizontal bar rises above the silhouette in the same manner as the actual horizon appears to rise above the nose of the ship with outside visual reference. When the airplane is climbed the bar falls below the center of the instrument. When the airplane is banked the bar remains in a position parallel to the actual horizon while the instrument case and face rotate on a fore and aft axis with the ship and consequently the airplane silhouette moves with the ship showing it to be at the same angle of bank relative to the horizontal bar as the ship actually is to the actual horizon.

Mounting

While in the two previous instruments discussed the rotors were mounted with their axles on a horizontal plane, the rotor in the artificial horizon is mounted with its spinning axis vertical. This is necessary in order that the bar representing the horizon may be held in a horizontal position. However, a gyro wheel mounted in this manner will have a tendency to precess away from the true vertical due to the friction of the bearings and this is corrected by using the same air which drives the rotor to create an opposite or erecting torque on the rotor, causing it to seek and hold its axle vertical. This is accomplished by mounting the rotor in a housing consisting of two chambers, the assembly being slightly pendulous. The rotor is mounted in the upper chamber and while the lower chamber is empty, it has four exhaust ports spaced ninety degrees apart, each port being covered with a pendulous vane. The rotor housing is mounted in a gimbal ring having a freedom of movement of sixty degrees of climb or pitch, about a lateral axis. The gimbal ring is in turn mounted in the case about a longitudinal or fore and aft axis, with a freedom of ninety degrees of bank in either direction.

Operation

The air is removed from the instrument case by means of a venturi tube or other source of vacuum and the replacing air which drives the rotor enters through the rear gimbal ring bearing, flows through the gimbal ring to the upper chamber of the rotor housing where it is directed into the buckets on the rim of the rotor through two jets, the air flow striking the blades at an angle. The air then enters the lower chamber of the housing and then out into the instrument case through the four exhaust ports. The normal position of the pendulous vanes covering these ports allows the air to escape in four equal streams when the rotor axis is in a vertical position. However, when an outside force is exerted against the rotor due to acceleration or centrifugal force, the rotor will have a tendency to precess away from the vertical. When this occurs the rotor housing tilts, moving the pendulous vanes so that the air escapes in unequal streams which creates a reactive force that is unbalanced. This force acts in such a direction that it causes the rotor to precess back towards its normal position and when this position is reached the pendulous vanes once more balance the escaping air and the tendency to precess is removed.

Now we have seen that the rotor will maintain its axis of rotation due to the property of rigidity so long as no outside force is applied. And in the case of the artificial horizon, when an outside force acts against the rotor, it will precess away from its vertical plane of rotation only to be returned to its vertical position by a reactive force created by the design and construction of the instrument. Thus the precessions are very slight and of very little consequence. Since the rotor maintains its position in a practically constant position relative to space and the rotor housing is mounted in a gimbal ring which in normal operation maintains a horizontal position, it can readily be seen that the bar representing the horizon, being secured to the gimbal ring, will maintain its horizontal position. And as stated before, the gimbal ring being pivoted on a fore and aft axis, allows the airplane to turn about it in positions of bank up to ninety degrees in either direction. If the ship is banked over ninety degrees the gimbal ring will hit the stops and render the instrument inoperative.

The bar, while still maintaining its horizontal position, is caused to rise above and fall below the center of the instrument, indicating a nose down or nose up operation, by means of a reversing linkage. The link, which supports the horizon bar in front of the field representing the sky and ground, extends to the rear of the gimbal ring where it is secured by a pivot bearing allowing it to move at an angle of sixty degrees above or below the ring. There is a slot in the link near the rear through which extends a pin secured to the side of the rotor housing. The assembly of the horizon bar and link is very light and is balanced by means of a counter-balance weight on the opposite side of the pivot from the link. When the ship is in level flight, the pin from the rotor housing extending through the slot in the link, keeps the horizon bar in the center position of the face of the instrument. When the ship is nosed down the rear of the instrument case, and thus the rear of the gimbal ring, is moved in this direction. However, the rotor and housing maintain their positions due to the property of rigidity and the pin in the housing is now above the gimbal ring and has raised the link and horizon bar accordingly, or above the airplane silhouette on the face of the instrument. When the ship is climbed the resultant action is in the opposite direction and the horizon bar is caused to move below the airplane silhouette, indicating the ship is in a nose up position.

Thus, since the horizon bar remains in a horizontal position when the ship is banked and at the same time rises or falls in relation to the airplane silhouette when the ship is nosed down or up, the Artificial Horizon indicates at a glance the true position of the airplane relative to level flight, climb, dive or bank or the combination of the positions of climb and bank or dive and bank by the relative position of the airplane silhouette to the horizontal bar.

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